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LOGICAL PRAXIS

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LOGICAL PRAXIS:

COMPRISING

A SUMMARY OF THE PRINCIPLES OF LOGICAL SCIENCE

AND

Copious Exercises for Practical Application.

BY

HENRY N. DAY,

AUTHOR OF

Elements of Logic, Rhetoric, Rhetorical Praxis, Æsthetics, etc.

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PREFACE.

The more especial objects in the preparation of this work are: first, to bring the study of Logic within the course of instruction commonly prescribed in our colleges and seminaries, both as to the time allotted to it and also the stage of advancement in the course; and, secondly, to present the science in a more strictly scientific form and method than is to be found in most of the text books.

The book is accordingly designed for those who are first entering upon the study of mental science, and to be mastered by them in from four to eight weeks of study, according to the proficiency of the student, the portion of time allowed, and the extent to which the practice is carried.

The work is constructed on the exactest principles of logical method, being itself designed to exemplify these principles in the definitions and the scientific evolution of all the generic laws and forms of thought from its own nature. For a more extended exposition of the science and a vindication of what is new and peculiar in this more exact treatment of logic, the reader is referred to the author's larger work on the same general plan, entitled "Elements of Logic."

CONTENTS.

INTRODUCTION.

§ 1. Logic Defined as an Exact Science of Thought. § 2. Thought, the Term as used in Logic, Defined. § 3. Logic more fully Defined. § 4. Logical Science Divided into Doctrine of Elements and Doctrine of Method.

PART I.

ELEMENTS OF THOUGHT.

CHAPTER I.—LAWS OF THOUGHT.—§ 5. Laws Founded in Relation of Object to Attribute—Identity. § 6. Primitive and Derivative Thought. § 7. Positive and Negative Thought. § 8. Law of Contradiction. § 9. Law of Disjunction. § 10. Law of Exclusion. § 11. The Four Fundamental Laws.

CHAPTER II.—FORMS OF THOUGHT—1. THE JUDGMENT.—§ 12. The Judgment Defined. § 13. Thinking Distinguished from its Object or Matter. § 14. Matter of Thought; Terms; Copula. § 15. Judgment Composed of Three Elements.

EXERCISES IN THE PARTS OF A JUDGMENT.

§ 16. Kinds of Judgments. § 17. Divisions in Respect to Copula. § 18. Quality of the Copula—Simple and Disjunctive. § 19. Affirmative and Negative Judgments. § 20. Disjunctive Judgment. § 21. Disjunct Members. § 22. Disjunction either in Copula or Terms. § § 23, 24. Logical Opposition—Pure, Contradictory, Contrary. § 25. Logical Congruence. § 26. A Disjunctive

Judgment always Disjoins. § 27. Modality of the Copula. § 28. Divisions of Judgments in Respect to Modality—Assertory, Necessary, Contingent. § 29. Divisions of Judgments in Respect to Degree of Identification — Identical, Partial. § 30. Divisions of Judgments in Respect to Quality of the Terms—Categorical, Hypothetical. § 31. The Dilemma.

EXERCISES IN THE KINDS OF JUDGMENTS.

CHAPTER III. — FORMS OF THOUGHT — 2. THE CONCEPT. —§ 32. The Two Derivative Forms of Thought. § 33. The Concept Defined. § 34. Subject-concept and Predicate-concept. § 35. Single Concept; Simple Concept. § 36. Generic Concepts. § 37. Composite Concept. § 38. Definitions of the Several Kinds of Concepts. § 39. Logical Quantity—Extensive and Comprehensive. § 40. Amplification of Concepts; Generalization. § 41. Determination. § 42. Division. § 43. Partition. § 44. Relation of Extensive and Comprehensive Quantity. § 45. Nomenclature.

EXERCISES IN CONCEPTS.

CHAPTER IV.—FORMS OF THOUGHT.—3. THE REASONING. —§ 46. Reasoning Defined; its Two Parts and Signs. § 47. Its Two Kinds; Immediate and Mediate. § 48. Kinds of Immediate Reasonings: (1), Conversion. § 49. (2), Restriction. § 50. Modal Restriction. § 51. Quantitative Restriction. § 52. (3), Disjunction. § 53. (4), Transference of Quality. § 54. Transference of Modality. § 55. (5), Composition.

EXERCISES IN IMMEDIATE REASONINGS.

§ 56. Mediate Reasonings — Syllogisms; Categorical and Conditional. § 57. Categorical Reasonings; Deduction. § 58. Induction.

EXERCISES IN CATEGORICAL REASONINGS.

§ 59. Deductive Syllogism; its Nature and Principle. § 60. Its Three Terms—Major, Middle, and Minor. § 61. Its Three Propositions—Sumption, Subsumption, and Conclusion. § 62. Order of Statement. § 63. Quality of Propositions. § 64. Logical Mood and Figure.

EXERCISES IN DEDUCTIVE REASONINGS.

§ 65. Inductive Syllogism; its Nature and Principle. § 66. Its Three Terms and Propositions.

EXERCISES IN INDUCTIVE REASONINGS.

§ 67. Conditional Syllogisms. § 68. Its Two Modes—Ponent and Tollent. § 69. Its Two Kinds—Hypothetical and Disjunctive. § 70. Hypothetical Syllogism. § 71. Its Three Propositions. § 72. Its Two Modes—Ponent and Tollent. § 73. The Dilemma; its Four Forms.

EXERCISES IN HYPOTHETICAL REASONINGS.

§ 74. Disjunctive Syllogism—its Nature and Principle. § 75. Its Three Propositions.

EXERCISES IN DISJUNCTIVE REASONINGS.

§ 76. Irregular Syllogisms; Kinds. § 77. Complex Reasonings. § 78. The Polysyllogism. § 79. The Sorites and Epichirema. § 80. Progressive and Regressive Reasonings.

EXERCISES IN IRREGULAR REASONINGS.

PART II.

METHOD OF THOUGHT.

CHAPTER I.—INTRODUCTION.—§ 81. Logical Method; its Province. § 82. Threefold Conditions of Perfect Thought. § 83. Originating and Verifying Thought. § 84. Matter of Thought; its Reality. § 85. Material Conditions of Perfect Thought—Unity and Objective Congruence, Adequateness, and Accurateness. § 86. Kinds of Attributes—Quality, Action, Condition, and Relation. § 87. Formal Conditions of Perfect Thought—Logical Congruence, Clearness, Distinctness. § 88. Necessary and Contingent Truth. § 89. Applications of Thought to its Object. § 90. Verbal Conditions of Perfect Thought—Correctness and Perspicuousness. § 91. Classes of Nouns—Concretes. § 92. Attributes.

CHAPTER II.—METHOD OF THOUGHT—THE JUDGMENT.—§ 93. Verification of *Datum*. § 94. Material Conditions of a Judgment—Congruence. § 95. Adequateness. § 96. Accuracy. §97. Formal and Verbal Conditions. § 98. Method in Disjunctive Judgments. § 99. In Modal Judgments. § 100. In Partial Judgments. § 101. In Hypothetical Judgments. § 102. Summary of Conditions in Judgments.

CHAPTER III.—METHOD OF THOUGHT—THE CONCEPT.—§ 103. Verification of the *Datum*. § 104. Concepts Framed for Occasions of Use. § 105. Objective Laws of Concept. § 106. Subjective Law of Concepts. § 107. Generalization. § 108. Determination. § 109. Subjective Law of Concepts—Definition. § 110. Analysis. § 111. Division. § 112. Principle of Division. § 113. Rules of Division. § 114. Partition. § 115. Principle of Partition. § 116. Rules of Partition.

CHAPTER IV.—METHOD OF THOUGHT—THE REASONING.—§ 117. Verification of the Datum. § 118. Order in Verifying. § 119. Objective Law of Reasonings. § 120. Subjective Law of Reasonings. § 121. In Conversion. § 122. In Restriction. § 123. In Disjunction. § 124. In Transference. § 125. In Composition. § 126. In Mediate Reasonings. § 127. In Deductive Reasonings. § 128. Practical Rules for Verifying a Deduction. § 129. In Inductive Reasonings. § 130. In Hypothetical Reasonings. § 131. Practical Rules for Verifying a Hypothetical Reasoning. § 132. In the Dilemma. § 133. In the Disjunctive Reasoning. § 134. Practical Rules for Verifying a Disjunctive Reasoning. § 135. In the Polysyllogism. § 136. Fallacies; Kinds. § 137. Objective Fallacies. § 138. Formal Fallacies. § 139. Verbal Fallacies.

INTRODUCTION.

§ 1. Logic *is the Science of Thought.*

Science: Its different meanings.

The term *science* is used in divers meanings. In its lowest and loosest use it denotes simply knowledge. In its higher use it denotes systematized knowledge—knowledge reduced to a system—methodized, tabulated, coördinated knowledge. A description of the heavens which should present the phenomena of the sun, the planets, and the other heavenly bodies in some convenient order, distributing them into chapters or exhibiting the facts in tables, is called in this use of the term a science of astronomy. In a third, a still higher and more exact meaning, the term science denotes not only systematized and coördinated knowledge, but knowledge systematized and coördinated strictly in reference to a true and complete definition and analysis of the subject-matter of the science. There is, thus, a science of the heavenly bodies which presents the phenomena of the heavens in strict subordination to one or more of the essential attributes belonging to all these bodies, as, for instance, the attribute of gravity. We have in this a science of far higher character than in merely systematized knowledge, and of a far different form. The attribute, as the governing law, gives shape and place to all the parts of the science, as it is applied to the magnitudes of the heavenly bodies, to their motions, positions, orbits, disturbances of one another's motions, and the like. And the distinctive excellence of such a science is that it sets forth a law which will determine all the changes that these bodies can undergo in all time, so far as they are subject to gravity. We have now not only a method, but a method determined by a principle and springing out of it. We have what is called *an exact science.*

Logic an exact science.

Logic is a science in this last and highest and most exact sense. It is not merely a collection of the leading phenomena of thought classified and arranged in some accidental way; but a presentation of them strictly under the essential nature of all thought. It must not only have a method; but its method must be derived at once from the essential attribute of thought, from a true and exhaustive definition of thought. Its first step is to ascertain and fix the exact nature of thought; in other words to obtain an exact definition and analysis of it.

Thought—its different meanings.

§ 2. The term *thought* is employed in various meanings, which it is necessary carefully to distinguish. It is often used to denote the *faculty* of thought, or the *discursive intellect*, so called; often to denote the *exercise* of this faculty, or *thinking;* often to denote the *result* or *product* of this exercise of the faculty; and once more, to denote also the *object* of thought, or that of which we think. As these are all legitimate uses of the term, it is incumbent on the writer to be careful so to employ language as to prevent all doubt in which of these various senses he uses the term, and on the reader to be careful that he gives to the term always its intended meaning. In this treatise the term will be used in the third meaning enumerated, to denote the result or product of thinking, wherever there may be any ambiguity attending the use of it.

The term *thought* has also a wider and a narrower sense, in each of these four meanings. It is sometimes used to include all knowledge, all products of the intelligence as the faculty of knowledge. In this wider sense it includes not only thought proper, but also all simple perceptions. As the subject-matter of logic, on the other hand, it is used in the narrower sense to denote the knowledge that we have as the result of reflection on what we perceive. Its precise nature will best be understood from an exemplification.

Suppose that some object, *the sun*, is presented to our sense of sight. We then, as it is said, *perceive* the sun; we have a perception of the sun. We do not in this, in mere perception, distinguish the attributes of the sun from one another, as bright, or round, etc. But, after having this perception, we instantly begin to recognize this or that attribute of the sun; we recognize the sun as bright, as warm, as round, as in the heavens, and the like. Just at this stage thinking begins; we have a thought when we thus recognize an attribute of the object which we perceive. We may express this thought in words: we say *the sun is bright, the sun shines*, or *the sun is warm*, etc. So soon as we do this we begin to think, we have a thought.

Perception, thus, is a knowledge which we have of an external object when we do not distinguish any attribute as belonging to it. Thought is a knowledge in which some attribute is recognized as belonging to an object. This is the essential nature of all proper thought; it is KNOWLEDGE BY AN ATTRIBUTE.

Two kinds of knowledge.

Perception, it should be remarked, is but one kind of that knowledge which has no distinctive recognition of an attribute. Perception is limited to objects that are made known to us through our outward senses. But we have also knowledge of the operations of our own minds, knowledge of principles. We have what are called *intuitions*. Perceptions and intuitions make up what is called *presentative knowledge*. Thoughts, on the other hand, make up what is called *discursive* knowledge. It is so called because the mind, when producing proper thought, runs out in two different directions — *discurrit* — towards the object and towards the attribute. In simple perception it fastens only on one object — views its object as one, however composite it may be, or however many attributes it may, in the process of thinking, be recognized as having.

1. Presentative.

2. Discursive.

Cognition.

Farther, it may be observed here, that the result or product of perceiving as well as of thinking is alike technically called a *cognition*. A cognition thus is a knowledge whether presentative or discursive; although we often distinguish the latter as a *recognition*. In the same way, we are said to *cognize* as well in perception as in thinking; while we *recognize* in the latter.

Recognition.

Intelligence, Apprehensive and Discursive.

Perceptions and intuitions, it may further be remarked, are products of the *apprehensive* intelligence or *simple apprehension;* thoughts proper are products of the *discursive* intelligence.

Logic more fully defined.

§ 3. Logic may accordingly be more fully defined to be *that science which presents the elements of thought as a knowledge through attributes, in a method founded in the essential nature of thought, and directed to the proper end of all knowledge.*

Its parts.

§ 4. Logical science divides itself at once into two parts:—the first treating of the *elements* of thought; the second of *the method* of thought.

The elements of thought further are either its essential properties, in this use of them called *laws;* or the different kinds or *forms* in which thought appears.

PART I.

ELEMENTS OF THOUGHT.

CHAPTER I.

LAWS OF THOUGHT.

Laws of thought founded in relation of object to attribute.

§ 5. We have seen that the essential nature of thought consists in its being the knowledge of an object in relation to an attribute. All thought, in order to be thought, must therefore possess this character;—it must be the knowledge of some object in relation to some attribute, or of some attribute in relation to some object. This then must be true of all proper thought. In so far as any form of knowledge has this essential character, it is true thought, valid thought; in so far as it lacks this, it is not true thought, it is not valid thought.

Setting aside now any special consideration of what knowledge in the general is, and looking only to that kind of knowledge which is called thought, we discover that the law of all thought lies in the relation which the object thought of bears to its attribute. When I think *the sun is bright,* the essential nature of my thought lies in the relation recognized between the object *sun* and the attribute *bright.*

Nature of this relation.

This relation has been loosely called an *agreement, an accordance, an equation.* It is strictly and accurately an identity. When I think *the sun is bright,* I do no more and no less than identify the object *sun* with its attribute *bright.* This is indeed but one of its attributes; and in my thought I only identify the sun with one of its attributes;—my meaning in the expression is simply this:—the sun is, in respect of one of its attributes, bright. If I had embraced all the attributes of the sun in my thought, the identification would have been total and complete, whereas now it is but partial;—I think of the sun in relation only to a part—one—of its many attributes.

[The essential attribute of all positive thought is, then, that it identifies.] We have thus the most fundamental law of all positive thought—THE LAW OF IDENTITY.

Primitive and Derivative Thought

§ 6. Under this general law we recognize several distinct modifications. This fundamental law of Identity in its most direct and simple application only prescribes positively that in all thought there must be an identification of the object of which we think with an attribute. But in some derivative thought, as we shall see, this identification is not so palpable and explicit. We have accordingly modifications of thought in this respect. We have, in fact, *primitive* thought, and *derivative* thought.

Positive and Negative Thought

§ 7. Again, this law as stated is in its merely positive or affirmative form. There is the negative phrase also, inasmuch as we in thinking may deny as well as affirm. We may think an object not only as the same in some or all respects with an attribute, but also as not the same — as different from it. It is thus not merely the law of simple identity,—the law of the same—but, as it has been called, *the Law of the same and the different.*

Law of Contradiction.

§ 8. Farther, this general law of identity not only positively prescribes and enjoins, but it also forbids. We have in this view first, the positive phase of the law which requires that in order to valid thought the object be recognized as totally or partially the same as its attribute, and, secondly the negative phase which forbids any attempt to recognize the object as different from its attribute—that is, to recognize the different as the same or the same as the different. This prohibitory phase is called the *Law of Contradiction,* or more properly the *Law of Non-Contradiction,* as it requires that thought should not contradict itself; that is, should not recognize the same as the different, or the different as the same. This law thus forbids the attempt to think that *the sun* is in any respect otherwise than *bright.* If, as may be in the course of prolonged thinking, something be attributed to the sun which is contrary to the attribution of brightness, this law is violated, and the thinking is so far invalid and unsound.

Law of Disjunction.

§ 9. Still farther, when we think, we think of some object; and consequently that object, in order to be thought at all, must be thought as the same with the given attribute totally or partially or be thought as different. This is the so-called *Law of Disjunction.* It requires that in all thought we not only recognize a given object and a given attribute, but that we moreover recognize them as either the same or as different.

Law of Exclusion.

§ 10. There is likewise the prohibitory phase of this law of disjunction, which forbids that anything else be attempted in thought but to recognize either the same or the different in the object and the attribute. This is called the *Law of Disjunctive Exclusion* or more simply the *Law of Exclusion.* It has also been called the *Law of Excluded Middle,* as it excludes in all valid thought every third thing, every middle thing, besides the two—the object and the attribute, which moreover must be thought as the same or as the different.

The four fundamental laws of thought.

§ 11. The general law of Identity has in this last view of it the four distinguishable phases, which are familiarly recognized as the *four fundamental laws of thought:* viz.:—

I. THE LAW OF IDENTITY:—requiring that we ever think of an object to be the same as its attributes.

II. THE LAW OF CONTRADICTION:—forbidding that we think an object to be different from its attributes.

III. THE LAW OF DISJUNCTION:—requiring that we either think an object to be the same as its given attribute or think it to be different from such attribute ; and

IV. THE LAW OF EXCLUSION :—forbidding that we think an object to be any other than the same as the given attribute or different from it.

The first and third of these laws are positive; the second and fourth are prohibitory. The first and second look rather to the thinking subject and constitute the *subjective duad;* the third and fourth look rather to the object and constitute the *objective duad* of the four fundamental laws of thought.

CHAPTER II.

FORMS OF THOUGHT.—I. THE JUDGMENT.

The judgment the primitive form of thought.

§ 12. The primitive form of all thought is the judgment. From this the other forms are derived under the four fundamental laws of thought that have been stated. § 11. The judgment is defined as *the identification of an object with an attribute.* The thought, thus, that *the sun is bright,*

Defined.

is a judgment, inasmuch as the object, *sun*, is recognized as the same as the attribute, *bright.* In this case the identification, as, in truth, most commonly, is but partial, the object being identified with only one of divers attributes.

As expressed is a proposition or sentence.

A judgment expressed in words is called in logical science a *Proposition.* In grammar it is sometimes called a *Sentence.*

Thinking distinguished from the matter of thought.

§ 13. The thinking of an object is obviously distinguishable from the object itself which the thinking respects. The object, *sun*, and the attribute, *bright*, are distinct from the judging or thinking that the one is identical with the other—that the one belongs to the other, or is an attribute of it. The object is from without the thinking, and is presented or given to it. All thought, every judgment, thus, is dependent on something given to it, which is called the *datum* to thought, or the *matter* of thought. In the example, *the sun,* and *bright* as its attribute, constitute the *datum* or the matter of thought in the judgment, *the sun is bright.*

In the judgment supposed, *the sun is bright,* the *datum*, including both object and attribute, may have been presented to the mind as one and single. The sun is perceived, it may be, only as it is bright. The perception is single. But immediately, as by a necessity of its nature, the mind, having a perception of the sun as one and single, begins *to think*—to view this single object under the form of an object having an attribute. In the perception there is no separation of object and attribute, no distinction of either. They are one and the same. The distinction begins in the thought, and takes place under this particular form of object and attribute; and as these are really one—as the object cannot be different from its attributes—the thought must recognize these as the same, must identify them, or its work is empty or false.

But the twofold *datum* to all thought is not always and necessarily presented to the mind as one in one single perception or intuition. It is sometimes presented in its two parts separately, from different sources. Thus, in the judgment, *the sun is the center of the solar system,* while we have an object identified with an attribute as before, here the *sun* is presented to the mind through the sense of sight—through perception, while what is attributed to it, *center of the solar system,* has come into the mind through reflection upon divers observations.

Matter of thought or terms, twofold: Subject and predicate.

§ 14. The *datum* to thought or its matter is made up of the two parts, the object and the attribute. These are called the *terms* of the judgment. Moreover, the object to which something is attributed in the judgment is called the *subject,* and that which is attributed to the object is called the *predicate.*

Every judgment thus has two *terms:* one, the SUBJECT, or that of which something is judged; the other, the PREDICATE, or that which is judged of the subject.

Copula defined.

The essence of the judging act lies in the uniting of the subject and the predicate, and the recognizing of them as the same. This element in a judgment is called the COPULA. We may accordingly define the copula to be *that element of a judgment in which the terms are identified or differenced, or recognized as the same or as different.*

The copula, it should be noticed, is not always expressed in language by the so-called substantive verb *is, is not.* Sometimes, as in poetical or impassioned representation, it is not expressed at all. When the attribute is one expressing action, the copula is more frequently than otherwise combined with the predicate, as, *the sun shines.* The copula is sometimes expressed by such words as *contains, comprehends, consists of, involves,* and the like.

Every judgment composed of three elements.

§ 15. We find thus, that every simple judgment and consequently every such judgment expressed in language, that is, every logical proposition and every grammatical sentence, consists of three and only three elements:—the subject, the predicate, and the copula. Of these elements, the subject and the predicate, constituting the two terms, are the *datum* to the thought or its matter; and the third, the copula, is the element of pure thought. The act of thinking, it should be remembered, however, begins when the object, whether originally simple, as in a perception—*the sun*—or originally two-fold, as *sun* and *center of the system,* is distinguished as subject and attribute; and is completed only as these are recognized as one or the same, that is, are totally or partially identified.

As these three elements are necessary elements in all proper thought and always appear in every judgment as the one primitive form of thought, all derivative thought ever implies and presupposes these three sole elements, however complicated or however applied, or however modified or fragmentary the form of the thought may be.

EXERCISES IN THE PARTS OF A JUDGMENT.

Point out the words which severally express the subject, the predicate, and the copula in the following propositions:—

The spirit is deathless. The spirit never dies. The earth is heavy. The earth gravitates. Great was the wonder. Grandly was the undertaking effected. Before her steps walketh prudence. Knowledge is the pearl of price. How sublime the spectacle! There is no rain in that region. It is not material whether he go or stay. It rains. It is cloudy. To think is instructive. The year passes. Where he now resides is unknown. Why he removed has not been explained. It is not known why he removed. The sun is up. There is not a cloud in the sky. It is a sunny day. He of necessity remains weak who never exerts himself. Who shunneth disease hooteth at remedies. It is cruelty to load a falling man. Nothing is harmless that is mistaken for a virtue. It is a poor center of a man's actions, himself. Life every man holds dear. Though gods they were they died as men.

There be none of the affections which have been noted to fascinate or bewitch, but love and envy. Handsome is that handsome does. He denies himself who asks what it is impossible to grant. To err is human: to forgive divine. The city for wealth; the country for health. There is no joy without alloy. Easy learned is soon forgotten. All is not gold that glitters. There is no courage but in innocence. Many are the deserving men who are unfortunate. So false is faction. One aid to health is exercise.

KINDS OF JUDGMENTS.

Grounds of Division. § 16. Judgments are distinguished into different kinds in reference either to the copula or to the matter or *datum*.

1. In the Copula. § 17. There are three different characteristics of the copula, in respect to which judgments are divided, its quality, its modality, and its degree.

(1.) Quality § 18. By the QUALITY of the copula is signified the essential nature of a judgment. This we have found to be two-fold—*subjective,* looking directly to the thinking subject, and *objective,* looking more to the object of thought, § II. The Quality of the copula is accordingly two-fold:—

I. SIMPLE QUALITY, signifying the nature of a judgment as a simple recognition of identity or difference, giving rise to the two kinds of judgments —*Affirmative* and *Negative,* which are regulated by the first two laws of thought, § § 7. 8.

II. DISJUNCTIVE QUALITY, signifying the nature of a judgment as an alternative recognition of either identity or difference, giving rise to the *Disjunctive* judgment, which comes under the last two laws of thought, § 9, 10. We have thus the following definitions of judgments distinguished in respect of the quality of the copula.

§ 19. AN AFFIRMATIVE JUDGMENT recognizes the terms as the same, as, $a = b$; *A is B: the sun is bright.*

A NEGATIVE JUDGMENT recognizes the terms as not the same, that is, as different, as, *A is not B; the sun is not clouded.*

§ 20. A DISJUNCTIVE JUDGMENT recognizes the terms as being alternatively either the same or different; as, *A is either B or is not B; A is either B or C; the crystal either is or is not organic; the crystal is either organic or inorganic; either the sun or the earth is the center of the planetary system.*

Disjunct members.

§ 21. A disjunction implies at least two parts which are opposed to each other. These parts thus disjoined are called *Disjunct Members.* They are also, when the disjunction lies in the terms, sometimes called *Divisive members.* Thus, in the proposition, *A is either B or is not B,* the disjunct members are *is either B* and *is not B.* In the proposition, *The crystal either is or is not organic,* the disjunct members are *either is organic* and *is not organic.* In *The crystal is either organic or inorganic,* they are *organic* and *inorganic.*

Disjunctive Judgment of two forms.

§ 22. The Disjunctive Judgment is of two generic forms: 1. One in which the disjunction lies in the copula, as *A is B or is not B:* 2. The second in which the disjunction lies in the matter, as, *A. is B or C.*

Of this second form there are several varieties. The disjunction may be in the predicate, as, *A is B or C;* or in the subject, as, *A or B is C;* or, further, there may be more than two members, as, *A is B or C or D; angles are right or acute or obtuse.*

Logical Opposition.

§ 23. A Disjunctive Judgment thus always presents an alternative disjunction. The nature of this disjunction is such that either alternative excludes the other. The character in thought which it respects logicians have designated by the name *opposition.*

Defined.

LOGICAL OPPOSITION, accordingly, is the difference in quality recognized in thought.

Of three kinds.

It is of different kinds, as it may be either in the copula or in the matter of thought.

1. Pure.

PURE OPPOSITION lies in the copula, and is ever contradictory; as, *A is either B or it is not B; the sky is bright or it is not bright.*

Judgments of pure opposition, or as they are called, *pure contradictory judgments*, such as *A is B or is not B*, are, by the laws of Disjunction, necessarily true.

Opposition in the matter of thought is either *contradictory* or *contrary.*

2. Contradictory.

CONTRADICTORY OPPOSITION is that difference which exists between positive and negative attributes or objects. Thus *vertebrate* and *non-vertebrate*, *voluntary* and *involuntary*, are respectively contradictory opposites.

3. Contrary.

CONTRARY OPPOSITION is that difference which exists between incompatible attributes or objects. Thus, *round* and *square* are contraries. *Greek* and *Turk*, *fish* and *fowl*, are also respectively contraries; they cannot both be attributed to the same object, yet the denial of one does not necessitate the affirmation of any one of the others; as, if an object is not round, it does not follow that it is square.

Logical opposition further explained.

§ 24. As it is often indispensable to correct thought that these distinctions in logical opposition should be kept in clear view, they may profitably receive some further consideration. Pure contradictory opposition, lying in the thought itself—in the copula—comes directly under the fourth fundamental law—the law of Disjunctive Exclusion—which forbids our thinking any thing else than that an object is the same as the given attribute or that it is not the same. To whatever matter, therefore, it may be applied, the formula, *A is B or is not B*, is by the very necessities of thought ever true and valid.

Simple contradictory opposition, lying in the matter of thought, does not come immediately under this law of exclusion; and the formula, *A is B or is non-B*, is not necessarily true. Thus, the propositions, *A stone is vertebrate or is not vertebrate, its motion is voluntary or is not voluntary*, are by the laws of thought necessarily true. But the propositions, *A stone is vertebrate or non-vertebrate (invertebrate), its motion is voluntary or involuntary*, are not necessarily true, for no law of thought has shut us up to this alternative and excluded every third view. It belongs to logical method to show how the strict laws of thought are to be applied in validating this form of opposition.

Farther, in contrary opposition there is a still less close exclusion. A stone may be either round or square, or of any of divers other figures.

Logical Congruence.

§ 25. LOGICAL CONGRUENCE is the opposite of Logical Opposition. It is the harmony in thought of two or more objects or of two or more attributes.

Objects are in logic said to be congruent when they may be thought as having the same attribute; thus *man* and *beast* are congruent when thought as having the same attribute, *animal*; as, *man is animal, beast is animal.* They are, however, incongruent insofar as complementary of each other, that is, in reference to the opposite attributes, *rational* and *irrational.* These attributes cannot be brought into the same thought; they are opposites or incongruent, the one excluding the other.

Attributes are congruent or incongruent insofar as they can be thought of the same given subject; thus *bright* and *round* are congruent, for they may be thought of the same subject, *sun.*

The basis of all logical congruence lies accordingly in the unity of the consciousness in the judgment. Whatever objects can be united in the judgment as having the same attribute and whatever attributes can be thus united as having the same subject are congruent.

A disjunctive judgment always disjoins.

§ 26. It will be observed that a disjunctive judgment always *disjoins;* that is, recognizes such a kind of opposition that the one of the disjunct members excludes the other, § 23. Thus in the disjunctive judgment, *animals are vertebrate or invertebrate,* it is implied that if any animals are not vertebrate, they are invertebrate. But if there be no opposition, but really congruent matter is presented although in the form of disjunction, there is no proper disjunctive judgment. Thus the proposition, an *orange is prized for its sweetness or its juiciness,* is not a logical disjunctive judgment, for the parts of the predicate are not logically opposed so as to exclude each other from the same thought, but are perfectly congruent; as an orange may be both sweet and juicy.

(2). Modality.

§ 27. By the modality of the copula is signified the ground of its determination whether in pure thought itself or in its matter. All pure thought whether primitive or derivative is necessarily true; for thought cannot contradict itself. All thought that has not its ground in pure thought itself is not necessarily true; and to evince its truth we must resort either to accepted truth or to pure thought as its ground.

If this nature of the ground is recognized in the judgment, it is called a *modal judgment;* if not it is simply *assertory.* Moreover a modal judgment is either of pure thought or it is not.

Kinds of judgments as modals.

§ 28. In this character of modality, accordingly, is grounded the distinction of judgments into the three kinds of *Simple Assertory*, *Necessary*, and *Contingent.*

A SIMPLE ASSERTORY JUDGMENT is one in which there is no recognition of its ground as in pure thought or otherwise; as *the sun is bright; the sun is not clouded;* the *sun is either bright or clouded.*

A NECESSARY JUDGMENT is one whose ground is recognized as being of the character of pure thought.

A CONTINGENT JUDGMENT is one whose ground is recognized as not of the character of pure thought. Contingent judgments are subdivided in respect of degree. Thus we have *possible* and *probable* judgments, and the contrary.

The modality of the judgment is expressed in language by words called *modals* which express respectively these characters of necessity or of probability or of possibility as attaching to the copula; as the auxiliaries *must*, *may*, and the like, and the proper modals *necessarily*, *probably*, *possibly*, and the like. These *modals* which always belong to the copula need to be carefully distinguished from proper adverbs which belong to the predicate.

(3). Degree. Two kinds: — Identical and Partial.

§ 29. In respect of degree of identification, judgments are distinguished into two general classes. *Identical and Par-*

tial, according as the identification in the judgment is entire and complete or is extended to only a part of the matter.

AN IDENTICAL JUDGMENT is one in which the subject is identified wholly with the predicate; as $a=b$; *Logic is the Science of thought.*

If the terms are in the same words the proposition is called *tautological;* as *Right is right.*

A PARTIAL JUDGMENT is one in which the subject is but partially identified with the predicate; as *the sun is bright.*

To this class belong most of the judgments or propositions that are in current use in discourse. Except in pure thought or in exact science, we do not think all the attributes which belong to the subject; and even in exact science it is seldom if ever that the attributes of relation are all comprehended in the judgment. The subject is well nigh universally in use identified only with a part of the attributes that actually belong to it. The algebraical formula $a+b=c$ is not in the strictest sense an identical proposition, for only in respect of quantity is the subject identified with the attribute, —it is equal; but it is not identical in form, since it is viewed as resolved into parts while the attribute appears as an aggregated whole. In truth one of the terms in every judgment is a subject and the other is a predicate, and in this respect they are ever different. Moreover an attribute is never strictly but a part of the subject, for it is ever but one of manifold conceivable or real attributes. Identification in a judgment is accordingly ever more or less partial. Generally it looks only to the substance of the thought, not to the form either of the verbal expression or of the thought.

II. Matter of thought. Two kinds,—Categorical and Hypothetical.

§ 30. Judgments, further, are divided in respect to the Quality of their terms or their matter. The matter may be either a judgment or a simple object of thought. The distinction gives accordingly two kinds of judgments; the *Categorical* and the *Hypothetical.*

A CATEGORICAL JUDGMENT is one whose terms are not judgments but simple objects of thought: as, *The sun is bright; the sun does not shine.*

A HYPOTHETICAL JUDGMENT is one in which one or both of the terms are judgments; as, *If the sun shines, the room is light.*

This kind of judgment has been called *hypothetical,* because the subject usually has the form of a supposition,—*if the sun shines.* The form of expression which it takes may in truth be construed either as a simple judgment or as an abbreviated reasoning, containing a premise and a conclusion. If it be regarded as a proper judgment, it must be explained thus: The judgment that *the sun shines* involves the judgment that *the room is light.* The judgment is here a partial judgment in which the predicate is but one of the truths that belong or may be attributed to the subject,—is one of its parts. Generally it may more properly perhaps be classed as an abbreviated reasoning; but inasmuch as it often stands as a premise in a reasoning and therefore appears as a proposition, logicians have recognized it as a particular kind of judgment.

Antecedent, Consequent. The first member of a hypothetical proposition is called *the antecedent;* the second member is called *the consequent.*

§ 31. The disjunctive judgment may also appear as a constituent part of a hypothetical; as, *If the sun shines, the light in the room is either white or colored.* This kind of judgment is called the *Hypothetical Disjunctive* and also the *Dilemma.* It is defined as a disjunctive judgment whose terms are judgments.

There may be two or more members in the disjunction. If there are three the judgment is called a *Trilemma;* as, *Whether A is B or C or D, E is F.* If there are four members it is called a *Tetralemma.* Generally, when having more than two disjunct members, it is called a *Polylemma.*

EXERCISES IN THE KINDS OF JUDGMENT.

1. *Name the several judgments that follow.*

Quadrupeds are vertebrate. No insect is vertebrate. Every mistake is not culpable. Not one escaped. Animals are vertebrate or invertebrate. A proud man is necessarily a self deceived man. Truth may languish but can never perish. If the soul is incorruptible it is undying. No news is good news. All madmen are unwise. All unwise men are not mad. Right is right. Matter is either solid, or liquid, or gaseous. It is never too late to learn. A rolling stone gathers no moss. Where there is no law there is no trespass. They are at hand to parley or to fight. No yesterday returns.

No receiver, no thief. It is not the many oaths that make the truth. Invertebrate animals are either with longitudinal axis or not. All invertebrates without longitudinal axis are radiates. If an invertebrate has a longitudinal axis it is either a mollusk or an articulate. None but the brave deserve the fair. No alchemy is equal to saving. High regions are never without clouds. It is not in might to authorize oppression. Not being rich is not always an evil. Beggars should not be choosers. No one is always happy. Forbearance is no acquittance. The principal acids are oxacids or hydroacids. Not many of the metals are brittle. If ignorance is bliss, 'tis folly to be wise. Fame is no plant that grows on mortal soil. If the aye-aye be a bird, it is either carinate or struthious. He is either a fool or a knave. If he is not a fool, he is a knave. Money is money in these times. A triangle is a three-sided figure.

2. *Point out the negative judgments in the preceding list of proportions.*

3. *Point out the Disjunctive judgments in the list.*

4. *Point out the Modal judgments.*

5. *Point out the Identical judgments.*

6. *Point out the Hypothetical judgments.*

7. *Point out the Dilemmatic judgments.*

CHAPTER III.

FORMS OF THOUGHT.—II. THE CONCEPT.

Derivative forms of thought.

§ 32. From the judgment as the primitive form of all thought, there may spring two and only two derivative forms. Inasmuch as the two elements of every judgment are the matter and the copula, a derivation from it may be characteristically either in the form of the matter of a judgment, which as such matter may be used as the terms of other judgments, or in the copula form, that is, in the form of a proper judgment.

These two generic forms of all derived thought are the *Concept* and the *Reasoning*.

The Concept defined.

§ 33. THE CONCEPT is that derived form of thought which springs directly from the matter of a judgment, and appears in the form of such matter. Or, more briefly, the concept is a derivation of a logical term from the matter of a judgment or judgments.

Two kinds:—Subject - concept and Predicate-concept.

§ 34. The primitive forms of the concept arise from the analysis of the matter of a judgment into its two parts, the subject and the predicate

It should be borne in mind that the subject and the predicate, strictly speaking, spring from the judgment. There can be no subject and no predicate properly till we think or judge. Only as we think, does an object—a perception or an intuition—separate into a subject and a predicate. Or, if such a view be preferred, the genesis of the judgment and that of the terms are simultaneous. They form one organic whole, and neither can subsist without the other.

By analyzing the judgment when formed, we find first the two parts—the copula and the matter or terms; and then by analyzing the matter we find the two parts—the subject and the predicate.

The subject and the predicate are both called concepts, inasmuch as each is taken in the mind together with the other. There can be no subject without a predicate, as there can be no predicate without a subject. Each implies the other.

Single concept.

§ 35. The subject concept arising from the analysis of a primitive judgment, the object of which is a perception or an intuition, is single, that is, individual. Thus the subject in the judgment, *The sun is bright*, is single or individual. It is numerically one. The predicate of such a primitive judgment is *simple*. It is not thought as composed of divers attributes, but as being only one.

In logic, accordingly, the terms *single* and *individual* always respect a subject-concept, while *simple* respects a predicate-concept.

The single concept and the simple concept always, in a primitive judgment, arise simultaneously. As already stated, an analysis of the primitive judgment gives us, first, the two component parts—the copula and the matter; and then an analysis of the matter gives the subject and the predicate, which, in such a judgment, are, the one single and the other simple.

§ 36. There are two other kinds of concepts which are respectively the result of a synthesis of single concepts or of simple concepts.

Generic concepts:—Their origin.

The process of forming them may be thus exemplified: In the judgments *the sun is bright, the moon is bright, Venus is bright,* we have three single subjects with the same predicate *bright.* By a synthesis of these subjects we obtain an aggregated concept, which may be expressed in a single term as *luminary.* The result of such a synthesis of single concepts is called a *generic concept, a class-concept.* It is of course ever a subject-concept.

It is plain that the attribute *bright* may be predicated of *luminary* as well as of either one of the single subjects. The term *luminary* in fact only expresses in one word, in one thought, the several subjects of which the same attribute *bright* has been predicated, and to say *luminaries are bright* is equivalent to the expression *the sun, the moon, and Venus, are bright.*

It is plain, moreover, that we could not make this synthesis of subjects unless they all had the same predicate. If, for instance, we had the judgments *the sun is bright, the moon is gibbous,* we could not bring the subjects into any one thought; and language accordingly provides no term by which to express such a synthesis. In other words, the fundamental law of all thought—identity—requires that, in order to the synthesis of subjects to form a generic concept, the predicate of each of the subjects must be the same. This identical predicate in the synthesis of single concepts is called the *base* of the new concept.

Base.

Composite concept.

§ 37. The process of forming the concepts by synthesis of predicates is analogous. In the judgments *the sun is bright, the sun is round, the sun is material,* we may synthesize the predicates into one thought, and express the result in one word, as *body,* that will thus denote an aggregate of the attributes of color, figure, and matter, predicated of *the sun.*

It is plain also that there would be no warrant for combining these divers attributes, unless they had, in separate judgments, been all alike predicated of the same subject. This identical subject, in such a synthesis, is called *the base* of the new concept; and the concept, being a synthesis of simple concepts, is called a *composite concept.*

Definitions.

§ 38. We have thus the following definitions and general statements:—

All concepts are either *single, simple, generic, or composite.*

THE SINGLE CONCEPT is ever the single subject of a judgment.

THE SIMPLE CONCEPT is ever the simple predicate of a judgment.

THE GENERIC CONCEPT, called also CLASS-CONCEPT, is a concept arising from the synthesis of the subjects in judgments having the same predicate.

THE COMPOSITE CONCEPT is a concept arising from the synthesis of predicates in judgments having the same subject.

THE BASE of a concept is the common subject, or common predicate, in the judgments from which the concept is found.

Logical Quantity.

§ 39. The single concept, being one, is distinguished from the generic concept, being an aggregate of several, solely in respect of quantity. The simple concept is likewise distinguished from the composite concept solely in respect of quantity. But the quantity in the former case differs from the quantity in the latter case, inasmuch as one respects a synthesis of subjects, while the other respects a synthesis of attributes.

Two kinds:—

Logical Quantity is thus of two kinds, *Extensive* and *Comprehensive*.

Extensive.

EXTENSIVE QUANTITY, called also *Quantity in Extension*, or simply *Extension*, respects subjects in judgments. It distinguishes them as single subjects, or as aggregates of single subjects.

Comprehensive.

COMPREHENSIVE QUANTITY, also called *Intensive Quantity*, or *Quantity in Comprehension*, or simply *Comprehension* and *Intension*, respects predicates in judgments. It distinguishes them as simple, or as aggregates of simple predicates.

Amplification.

§ 40. Generic concepts may be combined either with single subjects or with other generic concepts, and likewise composite concepts with simple or with other composite concepts.

The general process of increasing the quantity of a concept is called *Amplification*. It may be applied to subject-concepts, that is in extensive quantity, or to predicate concepts, that is in comprehensive quantity.

Generalization.

The process of amplifying a concept in extensive quantity is called *Generalization*. Thus to the concept *luminary*, embracing, at first, we will suppose, only *the sun*, *the moon*, and *Venus*, we may add the single subjects *Jupiter*, *Mars*, or the generic concept *the stars*, embracing many individual subjects, of each of which the attribute *bright* may be predicated. We may proceed thus to unite in a still larger generic concept all subjects recognized as having the attribute *bright*.

Determination.

§ 41. The process of amplifying a concept in comprehensive quantity, that is of increasing the diversity of attributes, is called *Determination*. We may add thus to the concept *body* regarded as denoting a union of attributes, other attributes which may be simple or composite, as *animal*, *rational*, so that we have the group of attributes expressed in *rational animal body* (= *man*). By adding attributes we have *determined* more narrowly the objects denoted as having these attributes,—*man (= rational animal)*, having more attributes than *animal.*

Division.

§ 42. In an analogous way the quantity of a generic or of a composite concept may be reduced. The process of reducing the extensive quantity of a concept is called *Division.* Thus the generic concept *man* may be reduced by dividing the subjects contained in it into *civilized* and *uncivilized.* The result of division is ever a less number of subjects in each of the new concepts; e. g., *civilized man, uncivilized man*, each contain fewer subjects than *man.*

Partition.

§ 43. The process of reducing the comprehensive quantity of a concept is called *Partition.* Thus by taking away one of the attributes in the composite concept *man = (rational animal body)*, as *rational*, we have the smaller sum of attributes expressed by *animal body.* The result of partition is ever a less number of attributes in each of the new concepts; e. g., *rational* and *animal body* have each less attributes than the whole concept *man.*

Relation of Extensive and Comprehensive quantity.

§ 44. Hence arises a general law in respect to quantity. As the number of subjects in a concept is increased, the number of attributes is diminished; and *vice versa*, as the number of attributes is increased, the number of subjects is diminished. In other words: *The extension of a concept varies inversely as the comprehension.* Thus by adding to the subjects denoted by the term *planets (= wandering stars)*, those denoted by the term *fixed stars*, we increase the extension and gather into the new concept *stars* a larger number of subjects than were contained in *planets*. But we at the same time have diminished the attributes, for we have removed those of *wandering* from *planets* = *(wandering stars)* and of *fixed* from *fixed stars*. In other words the extension of *stars* is greater while the comprehension is less than that of *planets*.

Nomenclature.

§ 45. It is important to observe that language for the most part does not distinguish the concept in extension—the subject concept—from the concept in comprehension—the predicate concept—but generally expresses each by the same form of word. Thus *body* may point to a subject and denote some object that has the attributes belonging to body; or it may point to the attributes themselves. In fact most terms may be construed in either quantity; may be regarded as aggregates of subjects or of attributes. In like manner the proposition *man is mortal* may be interpreted in either of two ways; extensively as meaning that the concept *man* is part of the class *mortal*, or comprehensively as meaning that the complement of attributes of which the concept *man* is composed contains as one of its parts the attribute *mortal*. The simple and untechnical meaning is: the subject *man* is in respect of one of its attributes *mortal*. The explanation of this is found in the nature of the judgment as already expounded. It identifies subject with attribute.

Consequently we may interpret a judgment either untechnically, as we simply identify subject with attribute; or we may interpret in the light of logical technicality and then view it from the side of the subject and so interpret in extensive quantity, or from the side of the predicate and so interpret in comprehensive quantity.

It is to be observed, however, that the form of verbal expression often indicates from which side the view is rather to be taken. Thus *Man is a mortal*, is an expression from the subject side and points to extensive quantity; *Man has a mortal nature* is from the predicate side and points to comprehensive quantity. The essential character of the thought is the same in both cases. The difference in quantity is technically shown also in the use of the preposition *under* to express extension and of *in* to express comprehension. Thus *planet* is said to be contained *under* the concept *stars; rational in* the comprehensive concept *man*. A smaller concept in extension is in like manner said to be *subordinated* to a larger; in comprehension it is said to be *involved* in the larger.

The nomenclature of extension has been carried in logical systems to greater perfection and fullness than that of comprehension. Language thus distinguishes different degrees in the results of generalization and division which it does not distinguish in determination and partition. We have thus *individual* denoting object of a single concept; *genus* marking the highest degree in generalization; and *species* marking any class between a higher and a lower.

Farther, concepts in extension are said to be *coördinate* when they are parts of the same degree of the same concept. Thus, *horse*, *dog*, are coordinates, since they are parts of the same degree of the concept *animal*. Concepts, also, which are parts of more generic concepts are said to be *subordinate:* while these more generic concepts are in relation to the lower said to be *superordinate.*

Moreover, when logical division extends only to species and not to individuals, it is sometimes called *specification.*

Language has failed to furnish terms so fully and precisely marking distinctions in comprehensive quantity. Yet the terms *coördinate*, *subordinate*, and their paronyms are borrowed to denote analogous relations and distinctions in this kind of logical quantity. Attributes that are contained in other attributes are likewise said to be *involved.* Thus, in the attribute *human*, *animal* and *rational* are coördinate to each other, but both are involved in *human.*

Once more, as a word which originally was a proper attribute-word may be employed as a subject-word, so an original subject-word may be used as a predicate. Language generally, but not always, distinguishes by a peculiar form the predicate use from the subject use. Thus the adjective form of the attribute *good* is employed when it is used as a predicate; but the noun or subject-form, *goodness*, when used as a subject. In such propositions as, *Goodness is ever true and lovely*, we have a proper attribute-word used as a subject. In like manner, a proper subject-word takes on the adjective form to express an attribute; as, *sun*, *sunny*. In the proposition, *Beggars should not be choosers*, *choosers*, a subject-word, retains its form, although used as a predicate. Some terms are not of obvious character, whether proper subject-words or attribute-words; only philological science can determine in such cases. But in logic it is the use as a subject or a predicate, not the grammatical form, which marks its character.

EXERCISES IN CONCEPTS.

1. *Point out the single concepts in the following propositions.*

Sirius twinkles. The horse is fourfooted. Man is rational. Birds are twofooted and winged. The sun is bright. Animals are of four divisions. All living things are organic. Life is vegetative, animal, or spiritual. Spirit is immaterial. All men are mortal. Mortality is universal among men. Every mistake is not a proof of ignorance. The wicked shall fall by his own wickedness. A regiment consists of two battalions. Ice is cold. Time abates grief. Tyranny is irresponsible power. No news is good news. Good orators are not always good statesmen. Britain is an island. A man is a man. The wages of sin is death.

2. *Point out the simple concepts in the foregoing list.*

3. *Point out the generic concepts.*

4. *Point out the composite or predicate concepts.*

CHAPTER IV.

FORMS OF THOUGHT.—III. THE REASONING.

The reasoning defined.

§ 46. The REASONING is a derivation of one judgment from another.

Its two parts: Antecedent.

Consequent.

It consists of two parts: *the Antecedent*, which is the *datum*, and consists of the judgment or judgments from which the derivation proceeds; and the *Consequent*, which is the result of the derivation.

The proper sign in language of a reasoning is *therefore*, or some equivalent expression, as *consequently*, *since*, *because*, *for*, which connects the antecedent with the consequent.

Of two kinds.

§ 47. The reasoning is of two kinds: *Immediate*, in which the derivation is direct, or by a single step; and *Mediate*, in which the derivation is mediate, or by steps.

Immediate reasoning.

§ 48. Immediate reasonings are of several kinds.

Kinds: 1. Conversion.

1. The first kind of immediate reasonings is *Conversion*, which consists in a simple transposition of the terms of the antecedent or given judgments; as, *A is B; therefore B is A. Mercury is the nearest planet to*

the sun; therefore the nearest planet to the sun is Mercury.

Its validity.

The validity of this reasoning under the fundamental law of identity is obvious, so long as the terms are unchanged in their quantity. The great difficulty with this form of thought is encountered in partially identical propositions. It arises from the fact that in ordinary language the predicate is expressed by a term that may denote more as a subject than is properly meant by it when used as a predicate. Ordinarily a proposition merely identifies a certain attribute expressed by the predicate as one of the attributes of the subject. Thus, in *Mercury is bright*, the meaning is, that Mercury, in respect to one of its attributes, is bright, and not that all its attributes are contained in the one word *bright*. It belongs to the doctrine of logical method to show when and under what restrictions any given kind of proposition is convertible (§ 121). Obviously the law of identity validates any logical conversion in which neither the quality of the copula of the antecedent, nor the quantity of its terms is changed.

2. Restriction: Two varieties.

§ 49. The second kind of immediate reasonings is *Restriction*. It is of two varieties: *Modal Restriction*, which respects the copula; and *Quantitative Restriction*, which respects the terms of the antecedent.

Modal restriction.

§ 50. MODAL RESTRICTION reduces the modality of the antecedent; as, *A must be B, therefore A is B.*

Three comprehensive degrees of modality have been recognized (§ 28), *necessary*, *probable*, and *possible*, to which enumeration should be added here the *unmodified* or simply *true*. It is obvious that whatever is necessary is true; whatever is true is probable; and whatever is probable is possible. It is ever legitimate, therefore, to restrict the modality in this order of its several degrees.

Quantitative Restriction.

§ 51. QUANTITATIVE RESTRICTION reduces the quantity of one or both of the terms of the antecedent; as from the proposition, *Planets are heavenly bodies*, we may infer either that *Mercury is a heavenly body*, or that *planets are bodies*, or that *Mercury is a body.*

The validity of this form of reasoning is obvious from the very nature of terms as concepts.

3. Disjunction.

§ 52. The third kind of immediate reasoning is *Disjunction*, which consists in deriving from a disjunctive judgment a conclusion in regard to its members; as, *A is either B or C; therefore B is not C. Angles are either right, acute, or obtuse; therefore right angles are neither acute nor obtuse.*

The principle of this form of thought is found in the very nature of a disjunctive judgment. It is validated by the law of Disjunction, which obliges to the recognition of the different or of the same; which obliges us, in other words, if we think at all, to identify a subject either as having a given attribute or as not having it and consequently having some other or different attribute. A logical subject from the very nature of thought (§ 2) must have some attribute; if it be recognized as not having a certain named attribute, it must have some other attribute—a different. To this other—this different attribute—a disjunctive judgment limits the thought as its alternative. It requires us to think the one or the other; so that if we designate one as that which we cannot think, we are obliged by the nature of disjunctive thought to think the other.

4. Transference.

§ 53. The fourth kind of immediate reasonings is *Transference*, in which a derivation is made of quality or modality from the copula of the antecedent to the matter in the terms, or from the matter to the copula; as, *A crystal is not organic; therefore it is non-organic (= inorganic). Gratitude is not involuntary; therefore it is voluntary. All vice is voluntary; therefore no vice is involuntary. A is not B; ∴ A is non-B. A necessarily is B; ∴ A is a necessary B.*

Of Quality.

Transference of quality is of the four following forms: 1. *A is not B; ∴ A is non-B.* 2. *A is B; ∴ A is not non-B.* 3. *A is non-B; ∴ A is not B.* 4. *A is B; ∴ A is not non-B.* The last three forms are necessarily valid from the very nature of disjunction. Only the first needs special consideration; it is not necessarily valid (§ 124).

Of Modality.

§ 54. Transference of modality from the matter to the copula is always valid; as, *Alexander was the probable conqueror of Upper India; therefore Alexander was prob-*

ably conqueror, etc. What is necessary, or probable, or possible in matter must be so in thought, for all we can think in matter is but thought realized in it. The converse, that what is necessary in our thought is necessary really in matter, is not true. From the necessities of our thought we may be obliged to recognize the Flying Saurian—*Pterodactyle*—as a bird or as a reptile, and hence from its not being a reptile as necessarily being a bird; we cannot conclude from this that it was a necessary bird if in the sense of being necessary to the reality of things. So the probabilities or the possibilities in thought are not necessarily probabilities or possibilities in the objective reality of things, in which lies the ordinary matter of our thought.

5. Composition. § 55. The fifth kind of immediate reasonings is *Composition*, in which the subjects of several judgments having the same predicate, or the predicates of judgments having the same subject, are united; as, *Claw-footed animals are mammals; hoofed animals are mammals; therefore clawfooted and hoofed animals (= quadrupeds) are mammals. Man has feeling; man has intelligence; man has will; therefore man has feeling, intelligence, and will (= is rational.)*

This principle here is obviously the same as that of the synthetic concept (§ § 36, 37).

EXERCISES IN IMMEDIATE REASONINGS.

1. *Point out in the following list the Immediate Reasonings by Conversion.*

2. *Point out those by Restriction, whether Modal or Quantitative.*

3. *Point out those by Disjunction.*

4. *Point out those by Transference.*

5 *Point out those by Composition.*

Or, *name each reasoning on the list in order.*

All ruminants are herbivorous mammals that chew the cud; therefore all herbivorous mammals that chew the cud are ruminants.

All human action is voluntary or involuntary; therefore all that is not involuntary is voluntary.

The planets all reflect their light; therefore, the inferior planets, Mercury and Venus, are not self-luminous.

All birds are feathered bipeds; therefore all feathered bipeds are birds.

Man necessarily acts morally; therefore he is a moral agent.

Every animal has a circulatory system; every vegetable has a circulatory system; therefore all organic being has a circulatory system.

Equi-lateral triangles are equi-angular; therefore equi-angular triangles are equi-lateral.

Vertebrates are mammals or birds; therefore birds are not mammals.

The anemone has no proper corolla; therefore it is apetalous.

Planets are wandering stars; therefore wandering stars are planets.

A shrub is a perennial plant with woody stems; therefore perennial plants with woody stems are shrubs.

No mammals are oviparous; therefore no oviparous animals are mammals.

Cold-blooded vertebrates are either reptiles or fishes; therefore no fish is a reptile.

The monkey tribe of the old world are foot-handed; the monkey tribe of the new world are foot-handed, as are also those of Madagascar; therefore all of the monkey tribe are foot-handed.

Syllogism.

§ 56. Mediate reasonings, by distinction called *Syllogisms*, are derivations of judgments through new judgments.

Its two kinds.

Syllogisms are of two general classes: 1. *Categorical*, in which the derivation is through the matter of the judgment, consequently through a concept; 2. *Conditional*, in which the derivation is through the copula.

Mediate reasonings; two kinds—Deduction and Induction.

§ 57. All categorical reasoning is in the one or the other of the two general modes, Deduction and Induction.

Deduction, —its nature.

In Deduction, the movement of thought in the reasoning is ever from a whole to a part. It is directly founded on the principle of the concept, that the attribute belonging to any class concept belongs to each individual composing the class; or, in comprehensive quantity, that any component part of a composite attribute belongs to the subject to which the component attribute belongs.

Its law.

The fundamental law of *Deduction* accordingly is: every concept may be identified with any of its parts as such part; at the same time it is differenced from each part, as whole from a part.

Positive and prohibitory.

There are thus to be recognized the positive and the prohibitory sides of deductive law. The relation on which the law and the derivation in thought are founded is that of whole to part, and this relation presents the two phases—the whole is partially the same as its part, and the whole is not wholly the same as its part, that is, it is different from it. Thus if we have a class concept, *man*, made up of the single concepts *John*, *James*, *Peter*, on account of each of these individuals having the common attribute *rational;* then *man* is *partially* the same as *rational.* But as any given attribute is but a part of its subject, we are prohibited from ever using language importing that it is altogether the same as its subject—that the part is the same as the whole,—that *rational* is *man* in the sense that *all nationality is human.* The doctrine of method as applied to deductive reasoning accordingly recognizes these two phases of the deductive law.

Induction,—its nature.

§ 58. IN INDUCTION, the movement of thought in the reasoning is from one part to another part of the same whole. It is also founded on the principle of the concept that each individual of the class concept has the same attribute; or, in comprehensive quantity, that each of the component attributes belongs to the same subject. It follows that if there be found individuals belonging to the same class, the common attribute of the class found in any individual must belong to any other individual of the same class. Thus the geologist forms a class of animals having the common attribute of *chewing the cud.* He discovers that an individual of this class is *herbivorous* and that this is not an attribute that is accidental to the individual that he observes but pertaining to it as *ruminant.* He induces, from this observation that one *ruminant* is *herbivorous,* that any other is *herbivorous.* He induces accordingly from the recognition of existing species of ruminants being herbivorous that every extinct species was also herbivorous. So the botanist, finding a specimen of a new flower to be *pentandrous,* having five stamens, infers that every other of the same species is also pentandrous. In like manner in comprehensive quantity if there be found any one of the attributes making up a composite attribute belonging to a subject, then to that subject must belong any other of the component attributes. Thus if from the judgments, *man is intelligent, man is susceptible, man is free,* we gather up these divers attributes *intelligent, susceptible, free,* into one component attribute *rational,* then if we find in *man* as *rational* the attribute of *intelligent,* we conclude from his possessing that and being *rational,* he must be *free,*—we infer the attribute of *freedom* from the attribute of *intelligence* as parts of the same composite attribute *rational* belonging to *man.* If the concept *rational* has been legitimately made up, then it is clear that, in this induction from one component attribute to another, we are but retracing legitimate steps of thought.

Its law, positive and prohibitory.

The fundamental law of induction accordingly is:—every concept may be identified with any complementary concept as part of the same whole; at the same time it may be differenced from such complementary part as part from part. The doctrine of method recognizes this two-fold phase of the inductive law as identifying and also differencing.

It should be remarked that while the proper movement of thought in induction ends in a part as its true conclusion, very commonly the statement of the conclusion is extended to embrace the whole. Thus the naturalist finding a violet to be polypetalous infers by induction that any other violet is likewise polypetalous, and hence, summing up the results of more than one movement of thought, he states the aggregated result in the conclusion that all violets are polypetalous. The movement of thought is essentially the same. The child induces by a strict and pure induction when he infers from having once burnt his finger in the flame that if he should venture upon a second trial the result would be the same and therefore holds back from all flames; and the philosopher, when he induces from the single observation that one crystal of galena is cubical that any other is likewise cubical and so concludes that all crystals of galena are cubical, only adds to the strict and proper inductive conclusion an inference by composition § 55. The process of thought is predominantly inductive; and consequently modern sciences which have been built up by this method of thought are properly recognized as inductive sciences. The distinction which some logicians have drawn between *formal* and *real* induction as essential, does not exist any more than such a distinction between *formal* and *real* arithmetic. As addition and subtraction are the same essentially in the pure form of numbers as when applied to measuring acres or bushels, so formal and real induction are the same essentially, the one being pure form, the other mere application to existing things.

EXERCISES IN CATEGORICAL REASONINGS.

1. *Point out the deductive reasonings in the following examples.*

2. *Point out the inductive reasonings in the following examples.*

Or *name each reasoning in order.*

The planets move in elliptic orbits; therefore the asteroid last discovered moves in an ellipse.

The tree last year bore a reddish sweet apple; therefore its fruit will be the same the coming season.

All mammals are warm-blooded; therefore the whale is warm-blooded.

These captured zebras are solid-hoofed; therefore wild zebras are solid-hoofed.

The giraffes in the Paris Garden of Plants and the London Zoölogical Gardens are timid, gentle, and docile and browse on twigs and leaves; therefore all giraffes have the same characters.

"If the Catskill sandstone be the base of the carboniferous system in America, the old red sandstone of Scotland, which has been identified in age, must be the base of the carboniferous system in that country."—*Winchell.*

The ichthyosaurus had the teeth of a crocodile; therefore it was carnivorous.

"There are many cases, recorded by medical observers, of persons losing their sight, who have also lost the faculty of representing the images of visible objects. Similar cases are recorded in regard to the deaf. These facts make it, I think, more than probable that there are as many organs of imagination as there are organs of sense."—*Hamilton.*

Herbivorous animals have grinding teeth and a complicated digestive system; so it is accordingly with the giraffe.

Categorical; its two kinds.

§ 59. Categorical syllogisms are subdivided into two classes, Deductive and Inductive.

Deductive syllogism defined.

A Deductive Syllogism is a mediate reasoning in which the derivation is from a whole to a part through a concept which is respectively a part of that whole and a whole of that part; as *all men are mortal. The Grecian heroes were men; therefore, the Grecian heroes were mortal.*

In this example the reasoning turns on the concept *man* in the second proposition; only as this concept is recognized as part of the concept *all men,* and as the concept *Grecian heroes* is recognized as part of the concept *men,* can the reasoning be accepted as valid. It is obvious that on the principle of the concept the reasoning is legitimate; for every attribute which belongs to a class, must belong to every part of the class. If consequently we have recognized an attribute as belonging to a class, and have also recognized one or more objects as belonging to any part of that class, we must recognize the attribute as belonging to each or any of these objects.

Its principle.

The one principle accordingly on which the syllogism depends is this: that *a part of a part is a part of the whole*, so that what is true of the whole is true of every part. If we represent the larger whole by W, the lower part by P, and the intermediate concept by M, the formula of the deductive syllogism will be, *M is W; P is M; therefore P is W.*

Applicable to both quantities.

The principle applies as well to comprehensive as to extensive quantity. If thus the attribute *rational* is part of the attribute *human*, and the attribute *intelligent* is part of the attribute *rational*, *intelligent* is part of *human;* so that of whatever subject *human* may be predicated, *intelligent* may also be predicated.

Its three terms.

§ 60. In every valid deductive syllogism there must be three and there can be only three terms. They are called respectively the *major*, the *middle*, and the *minor* terms.

The minor term moreover must be a part of the middle, and the middle a like larger part of the major term.

Its three propositions.

§ 61. In every single deductive syllogism there must be three and there can be only three judgments expressed in three propositions. They are called respectively the *major premise,* also the *sumption*; the *minor premise,* also the *subsumption;* and the *conclusion.*

The sumption.

THE MAJOR PREMISE OR SUMPTION has for its terms the major and the middle terms; as, in the example given, the major term is *mortal,* and the middle term is *men.*

The subsumption.

THE MINOR PREMISE OR SUBSUMPTION has for its terms the minor and the middle, as, in the example given, the minor term *Grecian heroes* and the middle term *men.*

The conclusion.

THE CONCLUSION has for its terms the minor and the major terms; as *Grecian heroes* and *mortal.*

The major premise and the minor premise together make up the *antecedent;* and the consequent of a syllogism is called the *conclusion*

Order of statement not material.

§ 62. The order in which the judgments are expressed is of no importance to the validity of the reasoning. We may reason equally well: *The Grecian heroes were men; all men are mortal; therefore, the Grecian heroes were mortal;* or *the Grecian heroes were mortal; for they were men;* and *all men are mortal.* The essential elements of every valid deductive syllogism are three terms, one of which, the major, contains the second—the *middle*—which itself contains the third—the *minor;* and these three terms must be framed in three judgments, one of which, the major premise or the sumption, must identify or difference the middle and the major terms; the second of which, the minor premise or the subsumption, must identify the minor and the middle terms; and the third or the conclusion must identify or difference the minor and the major terms.

It is not necessary that all of the judgments should be expressed. Either of the premises may be implied; as *the Grecian heroes were men; therefore they were mortal;* or *all men are mortal; therefore the Grecian heroes were mortal.* A syllogism in which thus one of the premises is suppressed is called an *enthymeme.*

Enthymeme.

Sumption affirmative or negative.

§ 63. The major premise of a deductive syllogism may identify or difference; that is may be either an affirmative or a negative judgment. The minor premise must always be affirmative; for if the minor term is not a part of the middle term, there is no connection shown of it with the major term. Thus, from the judgments, *Man is mortal; Gabriel is not a man,* there could be no conclusion, because the minor term *Gabriel* is not recognized as part of the middle term, *man.* The conclusion identifies or differences, that is, is affirmative or negative according as the major premise is affirmative or negative. Thus we

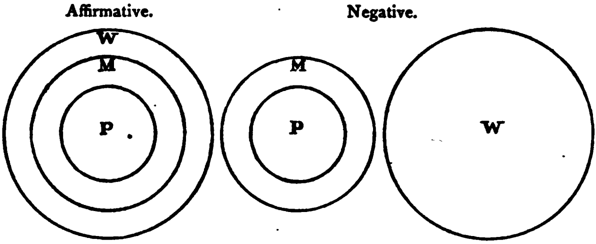
Subsumption always affirmative.

The quality of the conclusion, the same as that of the sumption.

have the negative form: *man is not omniscient; Newton was a man; therefore he was not omniscient.* Here the major premise excludes the attribute *omniscient* from among the attributes of the class *man*; the minor premise includes the minor term *Newton* in the class *man;* and therefore *Newton* as part of this class must be excluded from the attribute.

Symbols of relations of terms by circles.

The relationship between the three terms of a syllogism is well symbolized by three circles; the smallest circle symbolizing the minor term contained in another symbolizing the middle term; and this either contained in the third as when the major premise is affirmative or excluded from it as when that premise is negative. Denoting the terms by letters, the major by W (whole), the middle by M, and the minor by P (part), we have thus:—



Logical Mood and Figure.

§ 64. Logicians formerly were accustomed to distribute syllogisms into classes in reference to the quality and quantity of the judgments, and also in reference to the position of the middle term in the statement of the syllogism. But the more recent logic which has recognized disjunctive quality as well as that of affirmation and negation in judgments, and also comprehensive quantity as a coördinate with extensive quantity, and has, moreover, regarded the form of statement as immaterial to the integrity and validity of a reasoning, has discarded these distinctions as not well-founded, and therefore as fallacious. As however these distinctions enter so largely into logical literature it may be of service to know what they were, while still regarded as untrustworthy.

Mood defined. LOGICAL MOOD is the distinction of syllogisms in reference to the quality and quantity of the propositions. There were recognized four kinds of propositions distinguished in reference to their quality and quantity:—

Four Moods.

1 *Universal Affirmative,* as *all men are mortal;* designated by the letter A;

2. *Particular Affirmative,* as *some men are wise,*—E;

3. *Universal Negative,* as *no man is omniscient,*—I; and

4. *Particular Negative,* as *some men are not wise,* —O.

The possible combinations of these four propositions, A, E, I, O, in the three propositions of a syllogism are sixty-four (4 x 4 x 4); but only eleven of these are valid, each of the other fifty-three wanting some element essential to a sound reasoning.

Figure defined.

Four figures.

LOGICAL FIGURE is the distinction of syllogisms in reference to the position of the middle term. There are four figures or different positions which the middle term may occupy:—

1. *The first figure,* in which the middle term is the subject of the major and the predicate of the minor premise, as *man is mortal; Caius is a man; therefore Caius is mortal.*

2. *The second figure,* in which the middle term is predicate in each premise; as *ruminant animals are not carnivorous; the lion is carnivorous; therefore the lion is not a ruminant.*

3. *The third figure,* in which the middle term is subject in each premise; as *whales are warm-blooded animals; whales are aquatic; therefore some aquatic animals are warm-blooded.*

4. *The fourth figure,* in which the middle term is predicate of the major and subject of the minor, as *all greyhounds are dogs; all dogs are quadrupeds; therefore some quadrupeds are greyhounds.*

Of the valid moods there are four in each of the first and second figures; six in the third; and five in the fourth, making nineteen in all. As the first was esteemed the only perfect figure, a very ingenious system of rules was devised for the reduction of syllogisms in the three lower figures to the first. But Sir William Hamilton has shown that these rules are unphilosophical and therefore fallacious. They are unnecessary and cumbrous, as the simple application of the one principle in all deductive syllogisms is more easy and is ever conclusive and valid. This principle is, that whatever attribute is affirmed or denied of a whole class, may be affirmed or denied of any part of the class. The sole function of the mediating judgment, which is the minor premise, is to identify a lower expressed in the minor term as part of a higher class expressed in the middle term.

EXERCISES IN DEDUCTIVE REASONINGS.

1. *Name the minor term, the major term, and the middle term in each of the following reasonings.*

2. *Name in regular syllogistic order the sumption, the subsumption, and the conclusion in each of the following reasonings, supplying the wanting premise when necessary.*

NOTE.—The proper way of proceeding is first to recognize in thought the conclusion; its subject will be the minor term, and its predicate will be the major term. The middle term will be found in the given antecedent. Then the sumption can be formed of the middle term as subject and the major term as predicate; and the subsumption, of the minor term as subject and the middle term as predicate. The propositions should be arranged in the order of sumption, subsumption, and conclusion.

3. *Name each proposition in each syllogism thus regularly constructed as A, E, I, or O; and state what premises conclude in A; what in E; what in I; what in O.*

All planetary bodies revolve in elliptic orbits; the asteroids are planetary bodies; therefore, they revolve in elliptic orbits.

M is W; P is M; therefore P is W.

The planetary body just discovered has a very eccentric orbit; for it is an asteroid; and all asteroids have very eccentric orbits.

P is W, for P is M; and M is W.

Venus reflects its light; therefore Venus has phases like the moon.

P is M; therefore P is W.

All satellites revolve on their axes in the same direction as their primaries; therefore the moon revolves in the same direction as the earth.

M is W; therefore P is W.

The sun revolves on its axis from west to east; for it is the earth's primary.

P is W; for P is M.

The planetary body just discovered revolves between the orbits of Mars and Jupiter; for all the asteroids are in that part of the heavens.

P is W; for M is W.

Educated among savages, he could not be expected to know the customs of polite society.

P being M is W.

As almost all the organs of the body have a known use, the spleen must have some use.

M being W, P is W.

Unpleasant things are not always injurious; for afflictions are often salutary.

Solon must be considered a wise legislator, seeing that he adapted his laws to the temper of the Athenians.

I think; therefore I am.

Corporations have no souls; for they are created by the king and none can create souls but God.

Inductive syllogism.

§ 65. AN INDUCTIVE SYLLOGISM is a mediate reasoning in which the derivation is from one part to another complementary part of the same whole; as *Venus reflects the light of the sun; Mercury is a part of the same class of bodies as Venus; therefore, Mercury reflects the light of the sun; P is W; C is complementary of P; therefore C is W.*

The derivation is mediated here through the middle term *Venus* (P) which in the second judgment of the syllogism is identified as a like part of the same class—*Mercury* (C)—as its complementary.

Its validity.

The validity of this movement of thought is obvious, like that of the deductive syllogism, from the very nature of the concept. Each kind of reasoning implies one higher concept which is a synthesis of other lower concepts and ultimately of single or simple concepts, and also implies two other of such lower concepts which are consequently parts of this higher. In a deductive syllogism these parts are unlike parts, the one being a whole to the other and containing it; in an inductive syllogism the two are like parts, that is, are complementary each of the other.

If we recur to our exemplification of forming synthetic concepts § 36, we see that the primitive judgments, *the sun is bright, the moon is bright, Venus is bright,* enabled us, by synthesis of subjects, to form the concept *luminary.* Now if the *moon* and *Venus* were placed in one class, suppose, *satellites,* then the principle would be obvious in the deductive syllogism: *The satellites are luminaries (bright); Venus is a satellite; therefore Venus is a luminary (bright).* The principle is equally obvious in the inductive syllogism: *Venus is a luminary (bright); the moon is a complementary part with Venus of the concept luminary (bright); therefore the moon is a luminary (bright).*

We should indeed beforehand presume from the very nature of a synthetic concept, that there would be two entirely distinct derivations of thought; one being a movement of thought between a whole and a part; and the other, a movement of thought between the parts that make up the synthetic concept. The one is as natural and legitimate as the other. Both are alike serviceable in the advancement of knowledge. Similar objections have been urged against each with like failure, and similar difficulties have arisen in the application of the pure logical principles of the two processes to the knowledge of real objects. It may be added that probably because Aristotle, the father of logical science, omitted to elaborate a science of induction as he did a science of deduction, logicians have for the most part either passed over induction entirely or treated it in the most meager and unsatisfactory manner. Sir William Hamilton declares that all to be found in logical treatises up to his time on induction "is utterly erroneous;" while he himself excludes from logic as extraneous to the science what is commonly understood by the term. His own exposition substitutes for proper logical induction an entirely different process — that of the immediate reasoning by composition.

Induction moves alike in extensive and in comprehensive quantity;—in other words we may induce alike to classes or to attributes. Thus if *Greek* and *Roman* are recognized as complementaries in the class of *classic authors;* then if the Greek Homer is a classic poet, the Roman Virgil is also So if swans and ducks are complementary of each other; then if the duck is web-footed, the swan is also. In the same way recognizing the antelope as complementary, that is, as belonging to the same class as the ox, we induce from the fact that the ox chews the cud that the antelope does also; and from the fact that the ox has a divided hoof that the antelope has also.

The wide range of this process in the extension of Natural Science is seen at once from the fact that any attribute whatever found to belong to one of a given class so far as belonging to the class may be induced to belong to every other individual of the class Thus all observations on the respiration, circulation of the blood, digestion, muscular contraction, and the like in brute animals of any class are grounds of induction, that the same things are true of man also so far as animal. And on the other hand, finding two flowers to have the same characters, if one belongs to a known class, we do not hesitate to place the other in the same class. In the former case we induce from a class-concept as base to attribute; in the latter from an attribute concept as base to class.

Its three terms.

§ 66 In the inductive syllogism there are necessarily three terms: a major, a minor, and a middle; which last is the complementary of the minor and consequently a like part of the major term.

Three propositions. These three terms appear, in the full statement of the syllogism, in three propositions. One of these, the major premise or the sumption, identifies or differences the middle and the major terms; the minor premise or the subsumption identifies the middle with the minor or its complementary; and the conclusion identifies or differences the minor with the major term.

Their quality. Thus, as in the deductive syllogism, the sumption may be either affirmative or negative; the subsumption must be affirmative; the conclusion is affirmative or negative, according as the sumption is affirmative or negative.

It will be observed that the *middle term* which in the deductive syllogism is both a middle in quantity between the major and minor terms, and also a middle as means of mediation between the two, is in the exposition of the inductive syllogism not a middle in quantity, but only a middle as means of mediation.

EXERCISES IN INDUCTIVE REASONINGS.

1. *Name the minor term, the major term, and the middle term in each of the following reasonings.*

2. *Name in regular syllogistic order, the sumption, the subsumption, and the conclusion in each of the following reasonings, supplying the wanting premise where necessary.*

NOTE.—The proper way of proceeding is first to recognize the

conclusion: then with its predicate as major and the third or middle term, which is here a complementary of the minor term, to be found in the antecedent, construct the sumption if not given, and with the subject of the conclusion as minor term and the third or middle (complementary) term, construct the subsumption if not given; and subjoin the conclusion.

This magnetized iron attracts these iron filings. This other piece of iron is magnetized; therefore it will attract the filings.

P is W; C is P; therefore C is W.

This iron is magnetic; it will therefore attract iron filings.

C is P; therefore C is W.

Magnetized iron attracts iron filings; therefore this piece of magnetized iron will attract iron filings.

P is W; therefore C is W.

This piece of iron will attract iron filings, for it is magnetic.

C is W; for C is P.

The earth's moon revolves like its primary from west to east; therefore the fourth moon of Jupiter revolves like its primary from west to east.

The disturbances of the motions of Uranus proved the existence of an undiscovered planet not within the known planetary system; Mercury suffers like disturbances to those of Uranus; therefore there is an undiscovered planet not within the known planetary system.

The circulation of the sap is in part due to capillary attraction, for that of the blood is due in part to that cause, and the circulatory system in plants is identical with that in animals.

The amethyst is a silicate, for it belongs to the same kind of minerals as chalcedony which is a silicate.

The sapphire belongs to the same class of minerals as common emery, and is therefore an oxyd of alumina.

Carbon is fusible in the compound blowpipe; so consequently is the diamond.

That grass field must be wet, for the grass here is covered with a heavy dew.

The water pitcher is covered with moisture; we may therefore expect to night, if it is clear, a heavy dew.

The expenditure of muscular force represents a definite combustion of the bodily substance, as we may infer from the use of steam in the locomotive.

Conditional Reasoning defined.

§ 67. The second class of Mediate Reasonings is the *Conditional* which mediates the derivation of the thought through a judgment; as *If virtue is voluntary, vice is voluntary; but virtue is voluntary; therefore, vice is voluntary; If A is B, C is D; but C is not D; therefore A is not B.*

The reasoning here, it will be observed, turns wholly upon the copula *(is, is not)*,—upon the affirmation or the negation, that is, upon the essence of the judgment. In this respect conditional syllogisms differ from categorical syllogisms in which the reasoning turns upon the matter of the thought, not on the copula.

Two modes:—Ponent.

§ 68. A conditional syllogism may proceed in either of two modes:—

1. *The Affirmative, the Ponent, or the Constructive mode, as If A is B, C is D; but A is B; therefore C is D;—*

2. Tollent.—*The Negative, the Tollent, or the Destructive mode; as If A is B, C is D; but C is not D; therefore A is not B.*

The judgment on which the reasoning turns is termed the *conditioning* judgment. In the last example, the conditioning judgment is *but C is not D.*

Two kinds.

§ 69. Conditional Syllogisms are distinguished, in respect of Quality, into two kinds—*Hypothetical* proceeding in Simple Quality; and *Disjunctive* proceeding in Disjunctive Quality.

Hypothetical Syllogism defined.

§ 70. A HYPOTHETICAL SYLLOGISM is a mediate conditional reasoning in which a new judgment is derived from a hypothetical judgment through the matter, which is here ever a judgment; as *If A is, B is; but A is; therefore B is.*

As shown in the exposition of the Hypothetical judgment, § 30, the meaning of the first proposition in this syllogism is simply this: the judgment that A is includes the truth or judgment that B is. The reasoning thus explicated is seen to move in simple quality, as it simply identifies the judgment that *B is* with the judgment *A is,* as one of its parts, and is thus distinguished from the disjunctive syllogism. But this judgment on which the reasoning turns is a virtual term—a part of the matter; it is a judgment used as a subject and it is upon the fact that this subject is a judgment that the reasoning turns. It is in this distinguished from the Categorical Syllogism in which the reasoning turns not upon a judgment but upon a concept.

Its three propositions.

§ 71. The Hypothetical Syllogism consists of three propositions—a sumption which is a hypothetical proposition having judgments not concepts for its matter, either of which may be taken as the conditioning judgment; a subsumption which affirms the antecedent or denies the consequent of this hypothetical sumption; and a conclusion which affirms the consequent or denies the antecedent of the sumption, according as the subsumption affirms or denies.

Modes.

§ 72. It may proceed either in the Affirmative, otherwise called the Ponent, also Constructive, mode; or in the Negative, Tollent, or Destructive mode. Thus having the sumption *If A is, B is;* in the Ponent mode, we affirm in the subsumption the antecedent *But A is;* and then in the conclusion, affirm the consequent *Therefore B is.*

In the Tollent mode, we deny the consequent in the subsumption, *But B is not;* and in the conclusion deny the antecedent *Therefore A is not.*

For an example in concrete matter, we may take the sumption *If matter is inert, there must be mind to move it.* In the Ponent mode the reasoning would run: Subsumption, *But matter is inert;* Conclusion, *Therefore there must be mind to move it.*

In the Tollent mode it would proceed: Subsumption, *But there is no mind to move it;* Conclusion, *Therefore matter is not inert.*

If it be asked why there might not be two other modes of proceeding in this syllogism, one by denying the antecedent in the subsumption and then in the conclusion denying the consequent of the sumption, as *If A is, B is; but A is not, therefore B is not;* the other by affirming the consequent and so affirming the antecedent, as *If A is, B is; but B is, therefore A is;* the answer is that the *datum* itself makes no provision for such a movement; it says nothing in the case that *A is not;* but only supposes that *A is;* and this, it affirms, involves the consequent. So it makes affirmation as to what will be if *B is* only so far as the judgment that *A is* involves it. It may be that it will be true that *B is* for some other reason than that *A is*, so that if *A is not,* still it may be that *B is;* as in the *sumption, if matter is inert, there must be mind to move it,* if the consequent were denied, it would not follow either that matter were inert or were not. In other words, in every hypothetical sumption, the antecedent involves the consequent, not the consequent the antecedent.

The dilemma.

§ 73. A variety of the hypothetical reasoning having for its sumption a hypothetico-disjunctive judgment or a dilemma, has an historical importance which renders it worthy of distinct mention. It was a great favorite with the Greek sophists on account of its affording a convenient cover for a fallacy or sophism, through the complexity of its elements. It is a purely hypothetical syllogism, as the reasoning does not turn at all upon the disjunction which appears in the sumption, but exclusively on the dependence of the consequent member upon the antecedent; as sumption, *whether A is B or is C or is D, E is F;* subsumption, but *A is B or is C or is D;* conclusion, *therefore E is F.*

Whether the substance spoken of is solid, or liquid, or gaseous; it must be elastic; but it is either solid or liquid, or gaseous; therefore it is elastic.

The dilemma may proceed in the ponent or in the tollent mode. Moreover, the disjunction may be in the antecedent or consequent of the hypothetical sumption.

Four forms.

We thus have the four forms of the dilemma:—

1. *Ponent with disjunct antecedent; as whether A is B or C, D is E; but A is B or C; therefore, D is E.*

2. *Tollent with disjunct antecedent; as if A is B or C, D is E; but D is not E; therefore A is neither B nor C.*

3. *Ponent with disjunct consequent;* as *if A is B, C is D or E; but E is B; therefore C is D or E.*

4. *Tollent with disjunct consequent;* as *if A is B, C is D or E; but C is neither D nor E;* therefore *A is not B.*

EXERCISES IN HYPOTHETICAL REASONINGS.

1. *Name in regular syllogistic order the sumption, the subsumption, and the conclusion in the following reasonings, supplying the wanting proposition when necessary.*

2. *Name the conditioning judgment and identify the reasoning accordingly as ponent or tollent.*

3. *Point out the dilemmas in the list.*

If virtue must under a perfect government in the end be rewarded, then virtuous men will be happy; but virtue under such a government must eventually receive its due reward; therefore, virtuous men will be happy.

If W is, P is; but W is; therefore P is.

If virtue must receive its due reward, then virtuous men will be happy; but virtuous men are not all happy in the present life; therefore virtue does not receive in the present life its due reward.

If W is, P is; but P is not; therefore W is not.

No rain has fallen, for if there had, it would be wet.

W is not, for if W is, P is.

The ground is wet, for if it has rained it must be.

P is, for if W is, P is.

If the moon has no atmosphere there cannot be any twilight; but it has no atmosphere; therefore there is no twilight on the surface of the moon.

If there be no future life, then either virtue receives its due reward in the present world or there is no perfect government administered over men;

but neither of these alternatives is true; therefore there is a future life.

If natural selection lengthened the neck of the giraffe to enable it to reach the foliage of trees for preservation in severe droughts, it should also have lengthened the necks of other ungulates in like circumstances; but it has so favored none but the giraffe; therefore, the principle of natural selection can not be accepted as accounting for the long neck of the giraffe.

Ye are not the true children of Abraham; for if ye were, ye would do the works of Abraham.

The solar heat cannot be the effect of combustion; for if it were, its supply could last but for a few thousand years at most.

There is no improbability in the supposition that vegetable germs may have been preserved to this time in the deposits of the glacial age; for if muscular fibre so deposited can survive, certainly vegetable tissues may; and yet we know that dogs and bears in Siberia eagerly devour the remains of the extinct mammoth.

Disjunctive syllogism defined.

§ 74. A DISJUNCTIVE SYLLOGISM is a mediate reasoning in which a new judgment is derived from a disjunctive judgment through a judgment removing the disjunction; as *A is B or C; but A is B; therefore, A is not C; the sponge is either mineral or animal; but it is not mineral; therefore it is animal.*

It is governed by the second pair of the fundamental laws of thought:—the law of disjunction, and the law of exclusion. Its principle is that under these laws *positing one disjunct member of a judgment necessarily sublates the other; or sublating one posits the other.*

Its three judgments. The sumption.

§ 75. The disjunctive syllogism is composed of three judgments. The sumption is a disjunctive proposition and must be affirmative from the necessity of thought, which under the law of disjunction, must affirm that the terms are identical or not identical.

The subsumption.

The subsumption removes the disjunction presented in the sumption. It may do this either by positing or by sublating either one of the disjunct members.

The conclusion.

The conclusion may be either affirmative or negative. If the subsumption posits one member, the conclusion sublates the other. This is the affirmative or ponent mode. If the subsumption sublates one member, the conclusion posits the other. This is the negative or tollent mode.

EXAMPLES:—Common sumption; *The ancients were in genius either superior to the moderns, or inferior, or equal:*

PONENT MODE:—Subsumption; *But the ancients were superior to the moderns;*

Conclusion:—*Therefore they were neither inferior nor equal.*

Or

Subsumption:—*But the ancients were either superior or equal to the moderns:*

Conclusion :—*Therefore they were not inferior.*

TOLLENT MODE :—Subsumption ; *But the ancients were not inferior.*

Conclusion : *Therefore they were superior or equal.*

Or

Subsumption ; *But the ancients were neither inferior nor equal ;*

Conclusion: *Therefore they were superior.*

EXERCISES IN DISJUNCTIVE REASONINGS.

1. *Name in regular syllogistic order, the sumption, the subsumption, and the conclusion in the following reasonings, supplying the wanting proposition when necessary.*

2. *Identify the reasoning as Ponent or Tollent.*

A fungus is either plant or animal ; but it is not animal ; therefore it is plant.

A is B or is C ; but it is not C ; therefore it is B.

The world is the product of intelligence or of chance ; but it is the work of intelligence ; therefore it is not the product of chance.

A is either B or C ; but it is B ; therefore it is not C.

Light must be a mode of motion ; for either it is a mode of motion, or it is material ; and it is not material.

A is B ; for A is B, or is C ; and it is not C.

Either the fourth commandment of the decalogue is not obligatory, or we are bound to set apart one day in seven for religious duties ; but the fourth commandment is obligatory.

Either virtue is not voluntary or vice is voluntary; but virtue is voluntary

He must be a knave; for he is evidently no fool, and he is either a knave or a fool.

The footprints in the sandstone of the Connecticut river valley are either those of reptiles or birds; but they must be the tracks of reptiles, for this was the age of Saurians: they are not therefore the tracks of birds.

Real induction, or the induction of common life is an operation of thought or it is not; if it is not an operation of thought, then it leads to no truth and it is utterly worthless; if it is an operation of thought, then it is within the scope of that science which explains the nature and expounds the laws of thought as thought.

Irregular Syllogisms.

§ 76. Syllogisms have been distinguished into different kinds in respect to the form in which they are stated. The form of statement of course does not affect the validity of the thought; but for the sake of brevity or other reasons in discourse the mode of statement is generally different from the proper, full and formal modes in which the syllogism is set forth in logical systems. All of these popular modes of statement if valid can be reduced to the regular logical forms, and it is the chief object in these systems to exhibit the true characters of all valid movements of thought in such forms in order that the looser modes of actual discourse may be easily reduced to them and so be verified by them.

Irregular syllogisms are of three kinds:—1. *Incomplete* as already exemplified in the Enthymeme, in which one premise is omitted § 62; 2. *Complex;* and 3. *Regressive.*

§ 77. COMPLEX REASONINGS consist of two or more reasonings combined. Immediate reasonings are thus often combined with one another and with mediate reasonings: and mediate reasonings are combined with one another in every possible variety of combination. Thus in the reasoning: *all birds are winged; therefore some winged animals are birds,* we have the two immediate reasonings of conversion and restriction combined. This complex reasoning is technically called *partitive conversion,* also *conversion by limitation* and *conversion per accidens.*

The reasoning: *all mammals are vertebrates; therefore no invertebrate is a mammal,* is complicated of conversion and transference. It is technically called *conversion by contraposition.*

The reasoning: *All mammals are vertebrates; whales are mammals; therefore some whales are vertebrates,* is complex of a deductive syllogism and restriction.

In the following example, we have a complication of two tollent hypothetical reasonings:—*If men were prudent, they would act morally for their own good; if benevolent, for the good of others; but many men will not act morally, either for their own good, or that of others; some men, therefore, are neither prudent nor benevolent.* In a full and separate statement we should have first the hypothetical syllogism: *if men were prudent they would act morally for their own good; but many men do not act morally for their own good; therefore many men are not prudent.* Then we should have a second with the conclusion, *therefore many men are not benevolent.* Finally, on the assumption that the men who are not prudent are of the same class as those who are not benevolent, we obtain the conclusion.

Polysyllogism.

Sometimes the reasoning in discourse contains more than one simple reasoning, each following syllogism depending on the preceding. It is then called a *Chain of Reasoning* or a *Polysyllogism* as distinguished from a single syllogism called for the sake of distinction a *Monosyllogism.* Thus as it is unnecessary to state the proposition which forms the conclusion of one syllogism and which is used as the sumption of a second, we may abbreviate the statement by combining into one connected chain of reasoning the two syllogisms. Thus in the two syllogisms, 1. *An animal is a substance; a quadruped is an animal; therefore a quadruped is a substance;* 2. *A quadruped is a substance; a horse is a quadruped; therefore a horse is a substance;* the statement of the proposition which is the conclusion of the first and the sumption of the second syllogism is unnecessary, as it is readily supplied in thought. We have thus the chain or polysyllogism: *An animal is a substance; a quadruped is an animal; a horse is a quadruped; therefore a horse is a substance.*

Number of single syllogisms in a chain.

§ 78. The Polysyllogism may contain two or more single syllogisms. There will be as many single syllogisms always in every chain of reasoning as there are middle terms if the polysyllogism is categorical, or as there are mediating judgments if it is conditional. Thus in the example given, there are two single syllogisms as there are two middle terms—*animal and quadruped.*

Sorites and epichirema.

§ 79. Sometimes in statement one of the syllogisms is connected with one of the premises. Thus in the polysyllogism, *an animal is a substance; a horse is an animal for it is a quadruped,* we have the statement abbreviated by connecting one of the syllogisms immediately with the premise *a horse is an animal,* by the conjunction, *for it is a quadruped.* Such a form of statement is called an *epichirema* to distinguish it from the regular form of a chain of reasoning which is called a *Sorites.*

A SORITES may accordingly be defined to be a polysyllogism in which the single syllogisms are stated in like relation to the whole series.

AN EPICHIREMA is a polysyllogism in which one or more of the single syllogisms is attached to a premise in one of the others.

Progressive and regressive reasoning.

§ 80. Moreover, the movement of thought may be stated as advancing from consequent to antecedent as well as in the more regular order which is from antecedent to consequent. Thus in the example given, *an animal is a substance; a quadruped is an animal; a horse is a quadruped; therefore a horse is a substance,* we have a movement from antecedent to consequent. This movement is for the sake of distinction called the *Progressive Reasoning.*

The other statement which presents the consequent first is called the *Regressive Reasoning;* thus—*a horse is a substance, for it is a quadruped; and a quadruped is an animal; and an animal is a substance.*

The Progressive reasoning is characterized by the conjunctions *therefore, consequently,* and the like; the regressive, by the conjunctions *for, because, since,* and the like.

The sorites, it will be noticed, is a polysyllogism which is purely progressive or regressive; the epichirema introduces a regressive movement into a chain otherwise progressive.

EXERCISES IN IRREGULAR REASONINGS.

1. *Resolve the complex reasonings in the following list, into their constituent reasonings and give to each its proper name.*

2. *Change the regressive reasonings into progressive.*

All just acts are expedient; therefore some unjust acts are inexpedient.

No unhappy persons are righteous; for all the righteous are happy.

No war is long popular, for every war increases taxation; and the popularity of any thing that touches our pockets is shortlived.

Some deserve to be imitated who are nevertheless fools; for whoever speaks the truth deserves to be imitated.

The preservation of society requires the adoption of a common measure, for the preservation of society requires exchange; and this requires equitable valuation of property; and this requires the adoption of a common measure.

The English are a brave people; a brave people are free; a free people are happy; therefore the English are happy.

A science is either pure or inductive; a pure science is either mathematical or logical; but astrology is neither mathematical nor logical, nor inductive; therefore, it is not a science.

The bat is a mammal; for it is either a mammal or a bird, and it is not a bird, for it is not oviparous.

If we have an intellectual nature in common, the reason is also common; if this is so, its essential attribute of law-giving is common; if this is so, there is a common law; if this is so, we are fellow-subjects; if this is so, we are members of a political community; if this is so, all mankind make up a kind of state.

PART II.

METHOD OF THOUGHT.

CHAPTER I.

INTRODUCTION.

Logical method: its province.

§ 81. The logical doctrine of Method presents the conditions of perfect thought in order to its end, which is truth, science, or perfect knowledge.

Threefold conditions of perfect thought.

§ 82. These conditions of perfect thought are threefold:—

Material.

1. *Material Conditions*, or those founded in the matter of thought constituting the *Objective Law of Thought;*

Formal.

2. *Formal Conditions*, or those founded in the nature of thought itself, constituting the *Subjective Law of Thought;* and

Verbal.

3. *Verbal Conditions*, or those founded in language as the instrument of thought, constituting the *Verbal Law of Thought.*

Originating and verifying thought.

§ 83. The specific end or object in thinking will vary according as we aim to produce new thought which shall be true, or to verify an already finished product of thought. Logical method will accordingly have a twofold procedure; one in producing new thought and the other in verifying a product of thought The one will properly be the exact reverse of the other. Although the movement of thought is thus diverse, and the distinction should in order to perfect thought be kept in mind, it will not be necessary to determine and set forth separately the specific modifications of the laws of method to suit each procedure. The two procedures are united in all extended thinking. Even in the simplest form of thought, the *datum* must be verified, before the mind can safely proceed to form its product. And generally, as in the solution of a mathematical problem, the verification must, in order to the fullest assurance of correctness, attend each step of the process in advancing to the resultant truth.

Matter of thought: its reality.

§ 84. The matter of thought is, as we have seen, presented to it—is ever a proper *datum*—and accordingly it 's ever assumed by thought. This *datum* to thought is always a cognition, and is the product of the Presentative faculty—a perception or intuition—or of the proper faculty of thought. It may be the product of either faculty exclusively, or of both together.

It does not properly belong to logical science to verify these presentations of our perceptive and intuitive faculties; to show that they exactly conform to their objects or to the reality of things. But as the object of thought is not mere empty forms but substantial truth, logic must assume that our perceptions and our intuitions are trustworthy and that they give us in the main true cognitions of the world around. It must assume at least that there is a real world corresponding in certain respects to our own intelligence, so that when we observe and reflect according to the laws of our minds, our observations and reflections are conformed to the realities which they appear to regard. Logic, thus, as it revolts from the idea of being a mere phantom and unreal show, assumes that there is a universe of being around us into which our thought may enter and find everywhere what corresponds to its own nature; that this universe is but the treasure house of the same kind of thought that our own thinking nature produces, being governed by the same laws and having the same characteristics. It is only upon this assumption that any truth, any knowledge can ever be attained by us.

Unity and diversity in all thought.

It follows from this that inasmuch as thought is in its very nature *discursive*, discriminating in every object of knowledge, in every *datum* to thought, subject and attribute which it yet recognizes as one and the same and so ever identifies, every thing that can be known or thought by us must be accepted as admitting in its nature this discrimination and this identification. Every object that we can know may in other words rightly be viewed as subject having an attribute, which subject and attribute are inseparable and the same.

Further, the diversification which belongs to the essential nature of thought, implies that in every object of thought there is a diversity of attributes; any one or any number of which may in a given thought be identified with the subject. What precisely these attributes are in any case, are not determined by thought, but are given to it; while out of the diversity thus given the faculty of thought may select such as may subserve its purpose at the time.

Every object then that can be thought must be a unit and also a diversity—a single subject having a diversity of attributes—a whole having parts.

Material conditions of perfect thought: congruence.

§ 85. Attributes presented as belonging to the same subject are said to be in logical *congruence*—are congruent parts; while attributes that are not capable of being thought to belong to the same subject are in *logical opposition*—are *opposites.* Of this logical opposition in the matter of thought, besides the pure opposition in thought itself, we have distinguished the two degrees of contradictory and contrary opposition, § 23.

It follows that in order to perfect thought or true knowledge its object must be apprehended as one and as having congruent attributes.

Adequateness.

Still further, in order to true knowledge, the object must be apprehended just as it is, both as one whole and also as to its diverse parts;—it must be *adequately* apprehended, so that in the thought it shall be exactly conformed as a whole in all its boundary and extent to the object; and *accurately* apprehended, so that each part shall be conformed in itself and its relations to the corresponding part in the object.

Accurateness.

Such are the three material conditions of perfect thought; 1. *Unity and objective congruence* in the object itself and the parts of it regarded in the thought; 2. *Adequateness*, or conformity of the thought to the object as such a whole; and 3. *Accuracy*, or conformity of the thought to the parts severally in their own nature and in their relations as parts of one whole.

Kinds of attributes.

§ 86. The attributes which may be recognized in thought are reducible to four general classes; those of *Quality*, *Action*, *Condition*, and *Relation*.

All thought must regard its object either as a whole by itself or as a part of a whole. If the object be regarded as a whole by itself its attributes will be within it or intrinsic; they will be logical parts of the object. These attributes are called *Properties;* and are either qualities or actions, according as the object is viewed as a simple being or as a cause. Thus in the proposition, *the earth is heavy*, the attribute *heavy* is a quality of the earth regarded as simply being; in the propositions, *the earth gravitates*, *the earth attracts*, *gravitates* and *attracts* express actions and regard the earth as a cause of motion or attraction. In both cases the attributes

Properties of quality and action.

are intrinsic, are properties belonging to the earth as a whole by itself. In recognizing them the mind does not go beyond the object.

Extrinsic attributes of condition and relation.

If the object be regarded as a part of a larger whole and thus be viewed out of itself and in relation to the whole or to the other parts, the attributes are *extrinsic*, and are called generally *Relations*. If the object as a part be viewed in relation to the whole, the attributes are attributes of condition; if in relation to the other parts, they are relations proper—relations in the strictest sense. Thus in the propositions *the earth is in the solar system*, the attribute is one of condition. In the proposition *the earth is larger than Mars*, the attribute is one of relation.

Formal conditions of thought.

§ 87. The formal conditions of perfect thought are threefold: 1. That it truly identify or difference; 2. That it be clear; and 3. That it be distinct.

Harmony.

The first condition named respects the essential function in all thought;—it must identify or difference. The perfection depending on this condition is called from the positive side—*Harmony* or logical *Congruence*. It is of course but the thought-side of the first material condition mentioned § 85.

Clearness.

The second condition—Clearness—respects the nature of thought as a product of the intelligence when its object is viewed as a single whole by itself separated from all other objects.

Distinctness.

The third condition—Distinctness—respects the nature of thought when its object is viewed as a whole consisting of parts.

Thus I have a *clear* thought of the earth when I view it as one whole completely separated from all other objects. I have a *distinct* thought of the earth when I view it in its several parts each separated from the others and in its just relations to them.

This distinction becomes of important use in the treatment of concepts

Necessary and contingent truth.

§ 88. When the formal conditions of knowledge are observed, we have so far necessary truth, as has been before observed, § 27. The distinction between necessary and contingent truth lies primarily and originally in this—that all legitimate movements in thought are characterized as necessary; as such that the opposite must be regarded as absurd or as in contradiction to the fundamental principles of knowledge, while contingent truth is that which is reached in some mode not subject to the necessities of thought.

Pure thought gives ever necessary truth; contingency properly comes from the matter of thought. The truth of perceptions and of intuitions, thought accepts; but the fruit of observation or of experience does not bear the character of necessity, like the pure movements of thought. If a field is sixty rods long and forty rods wide, the content is necessarily twenty-four hundred square rods. The calculation in thought does not verify the observation and the measurement; it only accepts them as possible. The statement of the content is a contingent truth—probable or possible—simply because the matter of the thought is contingent. Mathematical truth is necessary because it is the result of pure thought moving upon matter that cannot be questioned. Its *data* are suppositions or definitions; and the movements of thought upon these *data*, accepted as true beyond contradiction, give results that are equally beyond contradiction—are necessarily true. Surveying and astronomy being grounded on observation, are contingent sciences, because the original *data* to thought being observations are not verified in thought. As the matter of thought becomes verified in thought, the contingency approximates to necessity.

It should be remarked, however, that the fallible mind of man is liable to err even in pure thought; its results, in so far as subject to this possibility, are characterized as contingent. Still farther, the use of language as the necessary instrument of extended thought and its final embodiment, is subject to error; and is consequently an element of contingency in knowledge.

Applications of thought to object.

§ 89. So far as the movement of thought itself is concerned, the character of the *datum* to which the thinking is applied can make no difference in the result.

Whether the supposed field be a reality or not, sixty rods of length and forty rods of width give ever a superficial content of twenty-four hundred square rods. Yet, as we think in order that we may know the truth, it is not impertinent in determining the method of thought in order to perfect knowledge, to indicate the necessity of a careful attention to the character of the *datum* or the matter of which we think. If our aim in thinking be real knowledge, then the matter with which we start must be real;—it must have been legitimately given to our thought;—it must be a true cognition. This is the first condition then in all thought that aims at real truth, that its *datum* be a true cognition verified by the signs and characteristics by which presentative knowledge is to be accredited. Is this *datum* an actual perception not a phantasm, or is it an actual intuition, not a fancy; and is it a pure perception or intuition unmixed with other impressions or conceits; or is it a product of pure thought that has legitimately sprung from such a perception or intuition? If the *datum* be real, the result of any valid thought, movement upon it will be real also; if the *datum* be imaginary or of doubtful reality, the result of the thought-movement can have no higher character.

Verbal conditions of thought—correctness and perspicuousness.

§ 90. The verbal conditions of perfect thought are *Correctness* and *Perspicuousness*. The words used as the embodiments or as the instruments of thought, must correctly express the thought and also perspicuously signify what is meant, or the thought itself must falter or wholly fail. It will be seen that a large proportion of the fallacies in thought are to be traced to a faulty or deceptive use of words.

Sir William Hamilton has well observed that while language must ever follow thought, inasmuch as it is indeed the creation of thought, yet thought itself can proceed but a very little way without the support of language. He well likens the reciprocal relation between thought and language to that between a tunnel and its arch. The tunneling must begin before the arch can be supplied; but it cannot advance far without the support of the arch.

Classes of names: Concretes.

§ 91. Language embodies in its words or clauses the three different elements of thought,—the subject, the predicate, and the copula—and distinguishes them by different forms peculiar to each.

Words denoting subjects of propositions are called *Concretes*, and are of four different classes:—

1. *Proper names*, denoting single subjects, as *John*, *Venus*, *Malta*.
2. *Class names*, denoting subject concepts, as *man*. *star*, *island*.
3. *Collective names*, denoting wholes composed of individuals or numerical parts as groups and not as classes; as *army* composed of soldiers, *forest*, *multitude*.
4. *Mass names*, denoting wholes composed of spacial parts, as *air*, *water*, *body*.

Attributives.

§ 92. Words denoting attributes called *attributives*, also *connotatives*, are of the four classes corresponding to the four classes of attributes mentioned; *Qualities*, *Actions*, *Conditions*, *Relations*.

Attributes of Quality are in the English language more properly denoted by adjectives, as *round*, *heavy*.

Attributes of Action are expressed by verbs combining the attribute with the copula, as *attracts*, *runs*.

As attributes themselves may be thought as subjects of which other attributes are predicated, language gives to them the form of names and thus presents a class called *Abstracts*, which are distinguished from concretes, as original attribute words from original subject words.

CHAPTER II.

METHOD OF THOUGHT—THE JUDGMENT.

Verification of datum.

§ 93. In order to truth in its largest sense, an inquiry preliminary to the application of the proper conditions of perfect thought to any one of its special forms, will naturally arise in respect to the character of the *datum* itself. Is that real, or imaginary? Is it pure and unmixed? Is it embodied in words that accurately and perspicuously express it?

Farther, in order to objective truth, that is, a perfect knowledge of things about us as real, it must be assumed that these things about us, so far as objects of our thought, must admit of being known under the relation of subject and attribute. A judgment giving objective truth must assume that its *datum* may be correctly viewed as a whole—a subject—having parts—attributes; and moreover that these attributes while diverse are congruently united in this one whole or subject.

It does not lie within the province of Logic as the science of thought to demonstrate that the outer world and every object in it of which we think is actually thus a whole consisting of diverse parts. But it belongs to logical method, as guiding to truth or perfect knowledge, to show what thought will give this truth; and in order to this, it must assume that the object of knowledge is really a thing with attributes; that, for example, the sun is verily round and bright; that it warms and attracts; that it is in the heavens and the center of a system of heavenly bodies.

Material conditions in judgments: Congruence.

§ 94. Of the material conditions proper to thought, the first respects the unity and congruence of the *datum* or matter. The necessities of valid thought in a judgment require that if a plurality of objects are contained in the subject, or a diversity of attributes in the predicate, they should be so far congruent as to be capable of being thought as one whole. The incongruousness which is forbidden often lies concealed in particulars which escape notice. The word *centaur* denotes a union of man and horse, which is possible perhaps in some particular attributes, but utterly inconceivable in others. There are characteristics of the two, such for instance as that *man* is but two-footed while *horse* is four-footed, which are entirely incongruous, so that no perception could take in such a union. Although many things might be correctly thought of such a *datum* while the view was confined to congruous elements, as soon as the movement of thought turned upon those that are incongruous—those that cannot be joined in one object of perception—the whole procedure becomes fallacious, and the result is at least doubtful, perhaps unreal and false. The name *Her-*

cules represents a mythic character to whom in different myths are ascribed feats and experiences which are entirely irreconcilable in one person. To accept such a character as a true *datum*, and then to found upon it movements of thought however legitimate in themselves, can lead at best only to uncertainty, perhaps even to results empty of truth or monstrous and absurd.

Adequateness.

§ 95. The second material condition of perfect thought — *adequateness* — requires that the subject and the predicate in the *datum* be each apprehended in thought as neither more nor less than as given. If, for illustration, the notion of *science* as presented in the technical definition, *Logic is the science of thought*, be the *datum*, and a judgment be made by predicating of it such an attribute as *sentient*, the notion would be taken in a sense broader than its proper technical use in the definition admits; for *science* in this use denotes reflective and systematic knowledge, which character does not belong to merely sentient knowledge.

Accuracy.

§ 96. The third material condition of perfect thought — *accuracy* — requires that the *datum* be apprehended as to its parts just as it is. Thus in the proposition, *thought is representative*, the judgment is inaccurate; for *representative* is not one of the proper parts of thought — not one of its true attributes.

The virtue of adequateness in a judgment properly and originally respects the subject; for that in a primitive judgment is taken as a whole and the predicate is taken as an attribute, that is, as a part of the subject. For the same reason the virtue of accuracy properly and originally respects the predicate. But derivatively nothing forbids that the judgment should be viewed throughout as in extensive quantity, and then the subject is a part of the predicate. Thus the proposition *the horse is an animal,* may in accordance with every principle of thought, be construed in the sense that *the horse is a part of the animal kingdom.* It is as legitimate as the proposition, *the horse is animal.* See § 39.

A similar remark may be made of such judgments as are made up of a subject and predicate separately given. Thus, while such propositions as *the sun is bright* are to be regarded as primitive and as the normal types of judgments, yet such propositions as *the sun is center of the solar system* are equally legitimate, although here the *datum* is not presented as a single object in which thought afterwards distinguishes subject and attribute, but as twofold, coming into the thought from separate directions. The two are united, identified in thought as subject and attribute—the latter being recognized as a part of the whole sphere of attributes pertaining to the subject.

The Objective Law of a judgment accordingly enjoins (1) congruence in the parts of the object thought; (2) adequateness, or exact correspondence in the thought to the object as a whole; and (3) accuracy, or exact correspondence in the thought to the several parts of the object.

Formal and verbal conditions in judgments.

§ 97. The Formal conditions of perfect thought, that it truly identify or difference, that it be clear, and that it be distinct, as also the verbal conditions of correctness and perspicuousness, need no further illustration in their application to the general forms of a judgment.

The conditions of perfect thought as applied specially to several of the divers kinds of judgments demand farther consideration.

Conditions of thought in disjunctive judgments.

§ 98. The Disjunctive judgment thus presents peculiar difficulties. Its essential nature consists in its *disjoining;* it must actually disjoin or it loses its character. But this disjunction, as has been shown, may be of divers kinds or degrees. We have thus pure contradictory opposition, when the judgment disjoins the two forms possible to thought — the identifying or the differencing — the affirmative or the negative; as in the formula *A either is B or it is not B.* If these two, A and B, come into the thought, and be viewed in their relations to each other as subject and attribute, it is of the very necessity of thought that it recognize them as the same or as different. This is the typical form of a disjunctive judgment.

But we have the form *A is either B or non-B, the stone is organic or inorganic,* in which the disjunction or opposition is not in the thought itself but in the matter — the predicate. This is called contradictory opposition, but it does not bear the character of perfect thought and does not give necessary truth. We may substitute another predicate which will give an untrue judgment; thus, *the stone is either vertebrate or invertebrate.* This form of disjunctive judgment then must be reducible to the form of a pure contradictory judgment before it can be accepted as necessarily valid. This may be done if the disjunct members, *organic* and *inorganic,* can be recognized as true disjunct alternatives; that is, if the judgment can be reduced to the form of a pure contradictory—*the stone is organic or is not organic.*

In the form *A is either B or C, the line is either straight or crooked,* it becomes necessary in order to verify the judgment as of necessary truth, to recognize *C* as the true alternative of *B, crooked* as the true alternative of *straight:* then it is to be verified as before.

In the form *A is B or C or D, angles are right or acute or obtuse,* still another step is requisite in the verification. It is necessary first to recognize *A as B or non-B, angles as right or not right,* and afterwards to recognize *non-B* as *C* or *D, not right* as *acute or obtuse.*

In short, a disjunctive judgment in the lower forms of opposition is to be verified by a reduction to the form of a pure contradictory opposition—a proper disjunction in thought. The proper test of this is that the two disjunct members are necessary alternatives, so that if either cannot be accepted the other must be, § 23.

Disjunctive particles.

The disjunctive particles, *either—or, neither—nor, whether—or*, are ambiguously used to express a disjunction in the thought or in the form of expression. It is necessary, therefore, carefully to see that the disjunction be unambiguously in the thought; otherwise the proposition is not a logical disjunctive. Thus, there is ambiguity in the propositions, "*His book will be condemned by verbal critics or grammarians:*" "*A class is a genus or species.*"

Moreover, the disjunctive *or* sometimes opposes congruent attributes; thus, "*A good horse is fleet or strong.*" It is used still farther as a true copulative, where the attention is to be directed to separate views; as "*The ruins of Greece or Rome are but the monuments of her former greatness.*"

In modal judgments.

§ 99. In the class of judgments distinguished in respect of their modality, the liability to error is twofold. The first lies in an unlawful substitution of a lower for a higher degree, as of a simple assertory or a problematic for an apodictic judgment. The second lies in an unlawful transference of the modality from the copula to the matter. See § 54. The judgment should be recognized as expressing no other modality than is intended.

In partial judgments.

§ 100. Most judgments in discourse are Partial judgments in which the subject is but part of the predicate, as "*the whale is a mammal,*" or, as is still more common, the predicate is but one—is but a part—of the attributes belonging to the subject, as *The whale is warm-blooded.* It becomes necessary, therefore, to recognize fully in partial judgments that only a part and also what part is thus expressed in the judgment. A partial attribution is often taken for a full definition—that is, for an identical judgment. Thus the proposition "*Life is the coördination of actions,*" is true as a partial judgment; but if interpreted as an identical judgment or an exact definition, it is not true; for then crystallization would be life, as it is a coördination of actions.

In hypothetical judgments.

§ 101. The peculiarity of the Hypothetical judgment is that the terms are judgments. It is necessary therefore in these judgments to recognize the antecedent as a judgment which involves the truth of the consequent. Farther, inasmuch as one truth may involve another, either by its being a whole of which the consequent is a part, or by its being a part of which the consequent is a complementary part, it is necessary to recognize which of these relations subsists between the terms. Thus the proposition, *If men were prudent they would act morally for their own good,* is verified by recognizing that the consequent *acting morally for their own good* is contained as a part in the more comprehensive judgment expressed in the antecedent, *if men were prudent.* It is verified in other words by analyzing the antecedent and finding the consequent among its parts.

But in the proposition, *If all the planets that have been observed have elliptic orbits, then those that have* *not been observed must have elliptic orbits,* the relation of antecedent to consequent is that, not of a whole to a part, but of part to complementary part. The mode of recognizing the truth of the hypothetical judgment in this case is far different from that in the former.

Summary of conditions in judgments.

§ 102. In order to perfect thought, accordingly, in a judgment, we have, to express them summarily, the following conditions to observe:—

1. As to its Quality, to recognize it whether as identifying or as differencing; or if in Disjunctive Quality, as logically disjoining and whether in pure contradictory, contradictory, or contrary opposition;
2. As to its modality, to recognize it as assertory, problematic, or necessary;
3. As to degree of identification, to recognize it as total or partial;
4. As to the logical form of its matter, to recognize it as categorical or hypothetical; and if hypothetical, whether it expresses the relation of whole to part or of part to complementary part;
5. As to verbal expression to recognize it as corresponding to the thought—that it be correct—and also that it be perspicuous.

EXERCISES IN THE METHOD OF JUDGMENTS.

I. OBJECTIVE LAWS.—*Point out the errors in the following propositions in respect to unity or congruence, adequateness, and accuracy.*

Triangles are acute, obtuse, equilateral, or scalene.

We find in every stable government either an hereditary monarchy, or an enlightened and virtuous democracy, or misrule and sedition.

The domain of the United States comprehends both states and territorial organizations.

Triangles are right-angled, acute-angled, or spherical.

The planets, the comets, the asteroids, and the moon revolve around the sun in elliptic orbits.

Sensation, perception, imagination, memory, and judgment constitute the phenomena of the human mind.

All that makes up a virtuous act is a knowledge of duty and a disposition to do it.

The elements of a true civilization are a wise and just polity, a general intelligence, and an æsthetic culture.

Inductive sciences are those which are founded in actual observation; while deductive sciences proceed from mere assumptions of the human mind.

Inductive sciences are not comprehended within the sphere of the discursive intelligence which limits itself to the relations of the individual to the universal.

An acute-angled triangle is one which has an acute angle.

The ponderable bodies embrace solids and fluids, which with the imponderable bodies make up the entire class of material bodies.

II. Disjunctive Propositions.— 1. *Distinguish in the following propositions those that do not disjoin in contradictory opposition.*

2. *Test such as have more than two disjunct mem-*

bers by reducing them to others in true contradictory opposition.

3. *Point out such as are faulty in any respect, in matter, in thought, or in expression.*

Or *describe in order each proposition in respect to its disjunctive character.*

Trees are either evergreen or deciduous.

In morals we must advance or fall back.

A currency is good as it is safe, or as it is elastic, expanding and contracting with the wants of trade, or as it is of convenient denominations.

A good horse is valuable for speed or for strength.

Plants are annuals, biennials, or perennials.

Invertebrates are either radiates, or mollusks, or articulates.

Plants are either esculents, drugs, or poisons.

Virtue tends to procure us either the esteem of mankind, or the favor of God.

A successful author must be either very industrious or very talented.

Reason is her being, discursive or intuitive.

The cable was loosed or unloosed.

All life is rational, or sentient, or animal, or vegetable.

He is sitting, or lying, or standing.

Planets or their satellites include all the members of the solar system.

Herbs, shrubs, or trees embrace every vegetable growth.

III. HYPOTHETICAL PROPOSITIONS.— I. *Reduce the hypothetical to the propositional form of stating the terms.*

2. *Distinguish the Inductive propositions from the Deductive.*

If the ground is wet, rain has fallen

If pain is severe, it will be brief.

If the will of Henry VIII. was valid, James I. had no legal title to the throne of England.

If the flight of birds to the north has begun, vegetation must have started where they wintered.

If one angle of the triangle is right, the others are to each other complementary parts of a right angle.

If Mars has an atmosphere, the land as distinguished from the water must appear greenish, and the polar regions white from the presence of the snow.

If this fossil had horns, it was a ruminant.

If a stone tends to fall to the ground by force of gravitation, then the moon tends to fall to the earth.

If an ordinary pump will lift water only thirty-three feet in the valley, it will not lift it so high on the top of the mountain.

IV. VERBAL LAWS.—*Correct the faults in the following propositions, whether pertaining to the matter, the thought, or the verbal expression.*

All words which are signs of complex ideas furnish matter of mistake.

Fortunes are made by industry or frugality.

All that glitters is not gold.

Tropical climates only produce rice, bananas, and spices.

No trifling business will enrich a man.

All the trees in the park make a thick shade.

All the plays of Shakespeare cannot be read in a day.

CHAPTER III.

METHOD OF THOUGHT—THE CONCEPT.

Verification of the *datum*.

§ 103. As the concept is ever a derivative, its *datum* can be fully verified only through its primitive—the judgment from which it is formed. In order to be assured that it is true to the object which it represents, it is necessary to inquire first: Are these judgments rue—have these several subjects which are united in the concept really the common attribute predicated of them? Or in case of the comprehensive concept, do the several attributes predicated of the common subject actually belong to it?

No concept images a reality.

It will be remarked that the concept cannot from its very nature have its exact counterpart in the external world either in any group of objects standing apart from all other groups, each possessing only the attributes upon which, as common to them all, we have gathered them into a class; nor in any aggregate of attributes combined in some one object and no other. Each individual, for instance, in the class of objects which we have synthesized into the extensive concept *planet*, has manifold other attributes than those which have furnished the base of the class; nor is there any where to be found an aggregate of attributes existing by themselves exactly corresponding to those united in the comprehensive concept *animal*. Our vocabulary of concepts does not in fact contain exact images of external realities any more than does a case of type contain the exact images of the several words in a discourse. It would be as absurd to seek in concepts the exact forms of things without, as in the boxes of type to find the exact forms of words in a vocabulary. They spell all words, all things, but are not themselves the exact images of any words, any things.

In order, therefore, to verify our concepts as true representatives of external realities, we have only to seek whether there are realities brought to our thought through our perceptions as trustworthy channels which, when they are reflected upon, reveal themselves as possessing in common among other diverse attributes, the simple attribute or the aggregate of attributes on which the class is formed; or in the case of a comprehensive concept, whether there is the simple object given to our thought through our perception which possesses those several attributes that are combined in the concept. Unless there are objects external to us which have some one attribute in common, there can be no class-concept that truly represents the outer world; and unless divers attributes which we may distinguish in our thought are in some one object united together so as to form a congruent unity to our thought, then our attribute concepts are mere phantoms. If regarding the real world of objects and of events around us as a veritable creation uttering so many words of the Divine Creator and Ruler, we find our concepts spelling out rightly these words so far as we have observed them, then we are justified in accepting them to be valid and trustworthy, just as we would accept a font of type that spells out every word to which we apply it to be correctly made and correctly distributed in the case.

Concepts framed for occasions of use.

§ 104. We frame our concepts as we plan our fonts of type, according to the use we intend. As we have Greek fonts for Greek words, Roman for Roman, German for German, and moreover, italic and accented characters and the like for our divers objects in printing, so we frame concepts for different uses in knowledge. The astronomer groups the heavenly bodies into a peculiar class of concepts for his purposes ; the poet groups the same objects into another class for his uses ; the adoring worshiper into a third for his. The simple explanation is that each regards different attributes of the same objects, and so builds his classes on different foundations. In verifying as also in using these concepts we need to bear this in mind, else we fall into the same error and folly with him who should indiscriminately use Greek type to spell English words. The universe has not been distributed into just such classes as we may for our uses be pleased to construct ; and the attributes are not all collected into the same number and kind of unions as those to which our uses lead. The concepts are true to the world about us, as we have said, if they can be used to spell out correctly every ordinance of heaven to which they refer.

Objective law of Concepts.

§ 105. Passing now to the more strictly logical principles of method in forming and verifying the concept, the material conditions of perfect thought, constituting its Objective Law, prescribe in the first place that the terms which are united to form the concept be recognized as homologous terms, that is, as either subjects or predicates of judgments having the same base. If it be a subject or class-concept—an extensive concept—then all the terms that are united must be subjects and they must all have the same predicate. If it be a predicate or comprehensive concept, then all the terms that are united to compose it must be predicates and must all belong to the same subject. This is the law of *unity and congruence.*

Of Unity and Congruence.

In the second place this Objective Law of the concept prescribes that the base of the concept which is the common subject or the common predicate in the primitive judgment be exactly recognized in its extension or its comprehension. This is the law of *adequateness.*

Of Adequateness.

In the third place this Objective Law of the concept prescribes that the terms to be united into the concept be exactly recognized each in its extension or comprehension. This is the law of *accuracy.*

Of Accuracy.

Subjective Law of Congruence.

§ 106. The Formal conditions of perfect thought constituting the Subjective Law of the concept prescribe in the first place that the aggregation of the terms make up one congruous whole.

This law is the exact counterpart of the first objective law just stated; it is simply subjective, while that is objective; this looks at the thinking subject, that at the object thought. As the object, in order to be thought, must be one whole whose parts are congruent, so the thought of the object must actually recognize it as one and congruous.

Applied in Generalization.

This law has its application in the amplifying of concepts, § 40, the two processes of which being *Generalization*, or the amplification of an extensive concept, and *Determination*, or the amplification of a comprehensive concept.

Generalization — how effected.

§ 107. Generalization is effected by combining subjects having the same attribute. § 36. Thus beginning with an individual, as *Socrates*, given as subject in the judgment *Socrates is a citizen of Athens*, by combining *Plato*, *Xenophon*, *Aristotle*, subjects in like judgments, we form the class *Athenian*. By combining *Spartan*, *Theban*, with *Athenian* in such judgments as an *Athenian dwells in Greece*, we obtain the higher class *Grecian*. In similar ways we may rise to still higher gradations as *European*, *terrestrial*. Language will of course often fail to furnish already coined words for naming classes which are possible, since these are without limit.

The attribute in respect to which as the base the generalization proceeds is called the *principle of generalization.*

The logical principle of congruence in Generalization simply requires that only those subject concepts be combined which have the same attribute. But in generalizing for some use in positive knowledge, two leading things to be done as determined by this use are, first, to select the attribute on which we shall form our classes, and secondly, to fix upon the number of gradations in our proposed classes. These determinations lie outside of the proper province of pure logic. In the various sciences we find systems of classification varying with the proposed uses of the particular science and the character of the subject matter of the science. Pure logic recognizes only the three gradations of *individual, species* a group of individuals, and *genus* a group of species. Accordingly it may happen that a class may be a genus considered in relation to lower classes while it is a species in relation to higher. *Grecian,* thus, is a genus in relation to *Athenian,* but a species in relation to *European.* But in science of objects as real, the designations become more fixed, being determined in reference to actual attributes.

Natural History thus has furnished very precise and fixed systems of classification, as it has sought to ground itself almost exclusively on the purely objective attributes, with little reference to special use or occasion. The departments of this science which treat of organic being employ the term *species* in the more definite meaning to denote a class of living things that are capable of permanent propagation or that have the same ancestry. It is founded on the principle of *kind* in the natural world, by which like produces like—the same produces the same.

In Zoölogy Agassiz proposes the following gradation of classes:—

Types or Branches, founded on plan of structure;

Classes, on the manner of its execution;

Orders, on the greater or less complication in execution;

Families, on form;

Genera, on details of structure by which members of the same family differ from one another;

Species, on differences in the preparation of the parts and in the absolute size of the whole animal, in the color and ornamentation of the surface of the body, and in the relations of the individuals to one another and to the world around.

In Botany the leading gradations adopted by naturalists are *Series*, *Class*, *Order or Family*, *Genus*, *Species*. Under these respectively are divers subdivisions as *sub-class; sub-order*, *tribe*, *sub-tribe; sub-genus or section;* and under species, *variety*, *sub-variety*, etc.

In all the sciences the systems of classification are subject to change as in the progress of knowledge new observations are made or new relations of science arise. Still the pure logical principle applies everywhere, as do the principles of pure mathematics, in all diversities of subjects.

The principle of congruence as applied to generalization through diverse degrees requires that objects of different grades be not indiscriminately mingled together.

The Rules of Generalization accordingly are:—

1. Determine the attribute in the given subject which is to be the principle of generalization;

2. Add to the subject given to be generalized other subjects which have the attribute selected as the principle of generalization;

3. Arrange coördinate subjects together, and place subordinate subjects under their respective immediate superordinates.

Determination—how effected.

§ 108. DETERMINATION or the amplification of a comprehensive concept is effected by combining attributes belonging to the same subject, § 41. Thus to the attribute of Socrates as *observing* we may add the attribute of *reflecting*, and we obtain the ampler concept of *philosophising;* and by adding the attribute of *teaching*, we have the still more comprehensive concept of *teacher of philosophy;* and by adding the attribute of *moralizing*, we have the concept of *philosophical moralist.* The process is essentially but adding to a given attribute any other attributes belonging to the same subject.

Language does not always furnish single words for denoting amplified attribute-concepts so as to distinguish them from the corresponding subject-concept. Thus if to the attribute *round* as an attribute of the *sun*, we add another attribute—*bright*—

we have the amplified concept *bright-round*, not expressed by any authorized word in our vocabulary. If we were to add attributes of relation as *in the heavens*, *center of motion to planets*, etc., the poverty of language to express our amplifications would be more conspicuous.

This process is the exact analogue of generalization. By amplifying the attribute which marks a Series in Botanical Science, we reach the lower grade in generalization, called a Class; thus adding to the attribute *flowering*, that of *endogenous*, we reach one of the two classes into which flowering plants are distributed; adding characteristics of structure, we reach the lower grade of Orders.

The rules of Determination accordingly are:—

1. Determine the principle of determination which is ever some subject to which the attribute given to be determined belongs;

2. Add to the attribute given to be determined other attributes found in the subject which is selected as the principle of determination;

3. Arrange coördinate attributes together and place involved attributes respectively under those immediately comprehending them.

Of Clearness.

§ 109. The Subjective Law of method in the concept prescribes in the second place that the thought be *clear*.

Applied in Definition.

Clearness respects a concept viewed as a whole. It is the subjective counterpart of the objective quality of *adequateness*. § 105. The process for attaining clearness is termed by logicians *Definition*.

Logical Definition is accordingly that process in which a concept is discriminated from all other concepts.

It is analogous to the geographical bounding of a territory or tract of land. It limits its object from all other like objects.

It is necessarily positive; for a mere negation does not discriminate from all other objects. To say that *Pisidia is not Parthia*, or that *a whale is not a fish*, or that *a stone is not organic*, does not bound or define. Yet it should be remarked that a perfect definition, giving perfect clearness by discriminating from every other object, may, although necessarily appearing in an affirmative judgment, be effected by a negative attribute; thus the definitions that *a brute is an irrational (non-rational) animal* and that *an oblique angle is one that is non-right*, are logically good, for they clearly discriminate from all other objects.

The old rule of Definition was:—

Name the next higher genus and add the specific difference; thus *man* is defined to be *animal* [next higher genus] that is *rational* [specific difference] = *rational animal.* This rule is convenient and generally sufficient to secure the clearness which is the object of definition. But it is applicable only to class concepts or species. In truth the old logic limited its view almost exclusively to extensive quantity. Its teachings are consequently so far partial and one-sided.

It is not necessary to clearness that all the attributes be named; hence the rule that the definition must be a strictly convertible proposition is not sound The converse of *man is rational animal,* viz: *rational animal is man,* is not necessarily true; for the planets may have inhabitants that are both *animal* and *rational;* but unless they had other attributes, as *two-footed, upright, without wings,* etc., etc., they could not be classed as *men.* In truth, definition may sometimes be effected through the attributes of relation as well as through the essential attributes; and man can never know that he has ascertained even all the essential attributes of any external object, much less the relative attributes.

The definition of a subject-concept is more properly effected through the attribute or attributes which discriminate it from other subject-concepts; as *planet* is defined to be a star not fixed in its position in the heavens; or a heavenly body that revolves around the sun in a slightly eccentric orbit.

The definition of a predicate-concept or attribute is more properly effected through the subject or subjects to which it peculiarly belongs; thus *blue* is defined to be the attribute of color that characterizes the unclouded sky; *rational* to be the attribute which discriminates man from other animals.

Definition, however, is effected with equal facility and logical soundness through complementaries. Thus *radiate* is defined as complementary of *articulate* and *mollusk;* or, according to the old rule, by genus and specific difference as *invertebrate* having spheroidal structure.

A logical definition should be discriminated from a verbal, nominal, or etymological definition, which defines through synonyms or paronyms. Thus, the definitions of *grade* as a degree, and of *gradual* as proceeding by degrees are not logical.

The rules of Definition are :—

1. Recognize the term to be defined either as a subject-word or as an attribute-word.

2. Define subjects by their attributes, and attributes by their subjects ; or, define by complementary concept.

3. Select such attribute for defining subjects as will discriminate them from all other subjects ; and such subjects for defining attributes as will discriminate them from all other attributes.

Of distinctness.

§ 110. The Subjective Law of method in the Concept prescribes in the third place that the thought be *distinct.*

Distinctness in a concept respects its parts and implies that each of the parts be properly recognized in itself and in its relations to the whole and to each of the other parts. It is the subjective counterpart of *accuracy.* The process for attaining distinctness is *analysis.*

Applied in Division and Partition.

The analysis of a class concept is called *Division,* § 42 ; the analysis of an attribute-concept is called *Partition,* § 43.

Division — how effected.

§ 111. DIVISION is effected through the attributes which form the base of the concept to be divided simply by addition.

Thus, the class concept denoted by *man* is divided by adding to the attribute *human*, which is its base, the attribute *civilized*, and we thus have the two varieties of the class *man*, *civilized man*, and *uncivilized man (=savage)*. The necessity of dividing through the attribute lies in the fact that this being the base of the concept is that alone which secures unity. The principle is that a concept and its base, that is, that a subject concept and its corresponding attribute concept, vary inversely as each other, § 44. Thus in generalization, in passing to a higher and larger class, we take away from the attribute; while in descending from one class to a lower, we add to the attribute.

Inasmuch as to a great extent in language the same term is employed to denote both the subject concept and its corresponding attribute concept we obtain the rule, convenient but scientifically inexact in statement:—*To divide a concept add the attribute which will give one of the parts desired.* To divide *animal* thus in respect to an attribute which will give *man* as one of the parts, we add the attribute distinctive of *man (rational,)* and we have the division *rational animal (man)* and *irrational animal (brute).*

Dichotomy.

A division into two parts, the one of which must always in perfect division be complementary of the other, is called a dichotomous division—a *dichotomy.* This is the strictest logical division being founded on a pure contradictory opposition; and to it other divisions should be reduced in order to be perfectly verified.

Trichotomy.

If the division be into three parts, it is called a *trichotomy;* thus *angles are right, acute, or obtuse.* This is verified by two dichotomous divisions; thus *angles are right or non-right; non-right angles are less than right—acute,—or greater than right—obtuse.* Omitting in the final enunciation as unnecessary the second part given by the first division—*non-right*—as it appears in the two parts of the second division, we have the three parts—*right, acute, obtuse.*

Polytomy.

Division into more than three parts is called *polytomy.* It is verified by being reduced to corresponding dichotomies. Thus the common division of *vertebrate animals* is polytomous—*mammals, birds, reptiles, fishes.* To verify this by dichotomous division, the procedure would be—1. *Vertebrates are warm-blooded or cold-blooded;* 2. warm-blooded animals are *viviparous (=mammals) or oviparous (=birds;* 3. *cold-blooded animals are terrestrial (=reptiles) or aquatic (=fishes).* In order to a perfect verification it is necessary to ascertain by observation that the two members of each dichotomous division are all that exist in nature—that all *vertebrates* that are not *warm-blooded* are *cold-blooded;* that all warm-blooded animals that are not *viviparous* are *oviparous;* that all *cold-blooded* animals that are not *terrestrial* are *aquatic.* The two members in each dichotomy must be exactly complementary of each other, that is, have contradictory attributes.

Principle of Division.

§ 112. The division will vary with the attribute through which it is made. Thus the division of *angles* into *right, acute*, and *obtuse*, respects the attribute of relative magnitude; but a division might be made in respect to any other attribute belonging to angles; thus it may respect the surface on which it is formed and then the division would give angles on plane surfaces *(plane angles)* and *angles not on plane surfaces*, that is on curved surfaces—and a subdivision of these would give *spherical* and *non-spherical angles*. The kind of attribute thus selected through which the division is to be effected is called the *principle of division.*

As it is the purpose or use for which the division is made that must determine on which of the attributes the division is to be made, the first thing in division is to select the particular attribute which shall be the principle of division.

Rules of Division.

§ 113. The specific rules of logical division accordingly are:—

1. Select the attribute which shall be the principle of division. This for each division must be single and exclusive. Otherwise no distinctness, but rather confusion would result; as if angles were to be divided into *acute, spherical, obtuse*, etc. This rule does not prohibit the use of a different principle in effecting subdivisions from that used in the higher divisions. Thus *acute angles*

may be subdivided in respect to surface into *plane* and *curved*. In truth every successive subdivision will have its own principle.

2. Divide dichotomously. This is done by adding to the attribute taken as the principle of division any congruent attribute. In the final enunciation and use of the parts attained, there is of course no necessity for retaining those parts which are at a subsequent step subdivided into other parts that are named Thus, as before remarked, there is no necessity of enumerating in the result the higher species of angles *non-right*, inasmuch as its parts are all given in the lower parts, *acute* and *obtuse*. But to divide *American* into *North American*, *Canadian*, and *South American*, cannot be verified by reduction to dichotomous division, for in such division, *Canadian* would not be opposed to the other parts, or to either of them.

3. Enumerate all the parts. Thus the division of all angles into *plane* and *spherical* is incomplete, for it omits those that are on other surfaces than plane or spherical.

4. Enumerate in order. Subordinate parts must be placed below the next higher respectively, and coördinate parts be placed together Thus to enumerate the species of angles as *acute*, *right*, and *obtuse*, would violate logical order, for *acute* is of a lower order than *right*, and is coördinate with *obtuse*.

This process is so important and so frequently required in all kinds of thinking, we will exemplify the rules at greater length. We will take the class concept *man*. We will first divide in reference to one of its essential attributes—the quality *rational* The first division is effected by adding to *rational* any congruent attribute. We add *cultivated;* and thus have the dichotomous division: 1, *cultivated man;* 2, *uncultivated man (savage).* We take next the concept *cultivated man*, and adding some property of action as creating or producing, as *thought-producing*, we have (1) *cultivated man thought-producing (thinkers, philosophers, men of science);* and (2) *cultivated man producing otherwise than by thought.* This last class may be subdivided by adding an attribute distinguishing kind of object produced into (1) *producers of useful objects (artisans);* and (2) *producers of other objects*, which can be here only producers of objects of beauty (= *artists).* By adding some attribute of condition as of time to this last class *artists*, we have (1) *ancient* and (2) *modern artists;* or of place (1) *those of the new world* and (2) *those of the old;* which last in like way are further subdivided by more specific attributes of place into (1) *Asiatic* and (2) *non-Asiatic (= European).* Still further sub-divisions may be effected by adding any of the numerous attributes of relation. Or any one of either class of attributes may be taken as the principle, of any step in the process higher or lower, as the purpose or object in the division may require.

While this is the full regular logical method of division, the process, as in arithmetical calculations, may generally be more or less abbreviated; and the mind, when once thoroughly trained, may jump, as it were, by instinct, to results, while feeling assured of being scientifically correct.

Partition: how effected.

§ 114. Partition, or the analysis of an attribute or composite concept, is effected through the subject to which it belongs. It is the exact analogue of division. The subject of the attribute is its base, and accordingly the principle of its unity or identity. § 37. As the parsimony of language makes the same word express either quantity, and as thought has preferably moved in extensive quantity, it is not practicable to find words to exemplify this process in the details of which a division admits, and the procedure itself seems, therefore, at first awkward and unnatural. But the analysis of a composite attribute is a common necessity in thought and discourse; and therefore a facility in effecting it and in verifying is indispensable to the highest promotion and acquisition of knowledge. At all events it should be understood that partition, as the analysis of a composite attribute, is a true and valid logical process, and that any given partition can, if sound, be logically verified.

The logical validity of the process is sufficiently exemplified by retracing any process of division. Thus the attribute *artistic* or *producing objects of beauty*, is analyzed by adding to the class *artists* the class *artisans*, giving the larger class of producers. We find accordingly the dichotomous partition of *artistic* to be *productive* and *object of beauty*. By adding to the class *producers*, so as to form the higher class *cultivated men*, the complementary class *men of culture who do not produce*, i. e., *intelligent non-producers*, we find the parts of *productive* to be *intelligent* and *executive.* In other words, we find that the attributes making up the character of a man of culture who creates—*productive* in this sense—to be first *intelligence* or *skill* and secondly *executive power.*

Principle of Partition.

§ 115. The class-concept which thus furnishes one of the parts is called the *principle of partition.* This obviously must always be single for any one partition; but a lower partition may proceed from a new principle.

Partition, like Division, is in logical strictness, properly ever dichotomous. But by successive dichotomies, we may attain a trichotomy or a polytomy.

Rules of Partition.

§ 116. The rules of Partition accordingly are:—

1. Determine the one principle of partition, which is to be found in a class concept higher than that to which the given attribute belongs.
2. Proceed by dichotomous partition or verify by reduction to it.
3. Enumerate all the parts.
4. Enumerate them in order

EXERCISES IN THE METHOD OF CONCEPTS

1. *Form gradations of classes with an individual* man *as subject and with the attribute of* habitation *as the base;*

With the attribute of age;
With the attribute of condition;
With the attribute of color;
With the attribute of social relation;
Generalize from an individual plant *as subject;*
From an individual animal;
From an individual virtue *as* gratitude.

2. *Amplify by determination the following attributes, distinguishing essential from relative attributes.*

Being, Human, Organic, Endogenous, Vertebrate, Intelligent, Grateful, Social.

3. *Define the following terms:*

1. The Sun, a Plant, a Man, a Cedar, a Rose, a Virtue, a Monarchy, a Poem, a Statue, a Habit, a Law.

2. Bright, Curvilinear, Fragrant, Skill, Liquid, Organic, Credulous, True, Perspicuous, Rash, Weary, Courteous, Temperate.

4. *Divide the following concepts:*

Being, Mammals, Man, Carnivorous Quadrupeds, Ruminants, Birds, Reptiles, Radiates, Flowering Plants, Apetalous Plants, The Rose, The Honeysuckle, Rocks, Geological Ages, Physical Forces, Colors, Governments, Arts, Sciences, Virtues.

5. *Analyze by Partition the following concepts:*

Organic, Oviparous, Winged, Carnivorous, Batrachian, Mental, Moral, Civil, Patriotic, Artistic,

CHAPTER IV.

METHOD OF THOUGHT—THE REASONING.

Verification of the *datum.*

§ 117. As in the case of the Concept, so of the Reasoning, both being derivatives of thought, the *datum* can be verified as real or true to the external object only through the primitive—the judgment. Thus in the sophism: *To do good that evil may come is wrong; to punish is to do evil that good may come; therefore to punish is wrong*, the fallacy can be detected only by verifying the sumption—by determining whether it is true actually that to do evil that good may come in the sense of the proposition is always wrong. Thus also the reasoning: *Fishes are cold-blooded; the whale is a fish; therefore the whale is cold-blooded*, is valid if the subsumption be accepted as true; but that being false, the conclusion is false. The fallacy in such cases lies in the antecedent or premises—the *datum*—and can be exposed only by scrutinizing that. One thing to be done therefore in verifying a reasoning is to verify the *datum*—to recognize it as true to the reality.

Order of procedure in verifying.

§ 118. The order of procedure in verifying a reasoning is the reverse of that in forming it. In the latter case we begin with the *datum*—the antecedent—and from that proceed to the new truth to be found in the conclusion. In verifying, the conclusion being given, we begin more naturally with that and reverse the steps which have been taken in forming it. For purposes of convenience, the method in verifying will here for the most part be given, omitting that in forming the reasoning as unnecessary.

Objective law.

§ 119. The Objective law of a reasoning respects the logical character of the antecedent. It requires as a condition of perfect thought three things.

1. As to number of judgments.

First, it requires that the antecedent be recognized as to the number of judgments of which it consists. The observance of this law becomes particularly imperative from the fact that in common discourse, one judgment, as in the enthymeme, is often suppressed.

2. As to kind.

Secondly, it requires that the antecedent be recognized as to the kind of the several judgments of which it consists, whether affirmative or negative, or disjunctive; whether assertory, problematic, or necessary; whether categorical or hypothetical.

3. As to verbal expression.

Thirdly, it requires that the antecedent be recognized to be correctly represented throughout in the verbal form in which it appears. The two parts of this rule are, 1. that the language be exactly significant of the thought; and 2. that it be thought in the same sense in the several parts of the antecedent. Thus in the sophism: *No designing person ought to be trusted; engravers are by profession designers; therefore no engravers should be trusted,* the middle term is used in two different senses in the antecedent. It is the fallacy of the *ambiguous middle* so called.

Subjective law.

§ 120. The Subjective law of a reasoning respects the derivation of the conclusion from the antecedent. It requires 1. that a compound reasoning be resolved into its constituent reasonings; and 2. that each constituent reasoning be then thought out in accordance with its own particular laws.

The importance of the first of these requirements is seen in the fact that most unsound reasonings arise from the undiscriminated mingling of divers reasonings. As reasonings admit of indefinite combinations in discourse, immediate and mediate reasonings, each being joined with every other in the two classes, while the mind is following closely the movement of thought in one form, it is liable to overlook an error or lapse in some other of the combined forms. Thus in the reasoning, *every orderly arranged thing is vertebrate or is not vertebrate; a crystal is an orderly arranged thing; and it is not vertebrate; therefore it is invertebrate,* there is a combination of a disjunctive reasoning with one by transference; the former is sound; the latter is unauthorized. § 124.

The subjective law of a reasoning, although always a mere application of one or other of the four fundamental laws of thought, is modified variously in its application to the different forms of reasoning These applications will hence be presented in order separately.

Conversion.

§ 121. In logical Conversion, it requires that the character of the copula and of the terms be maintained unchanged. The special liability to error in this reasoning arises from the fact that generally in discourse the quantity of the terms is changed from extensive to comprehensive, and the predicate of the *datum* which is properly of comprehensive quantity is but one of diverse attributes belonging to the subject. Thus *all men are mortal,* when converted is strictly *all mortals are human, human* being the proper attribute form corresponding to the subject word *man.* But this conclusion is false; it is so because the predicate *mortal* in the original proposition is changed from an attribute into a subject of the attributes of which *human* denotes but one, some mortals being animals. In the loose form of expression, the quantity is changed from being *undistributed,* as it is said, to be *distributed;* that is, *mortal* in the *datum man is mortal,* is not distributed to all of the class to which this attribute belongs; but in the converse *mortals are men,* it is distributed, as the subject here includes all individuals having the attribute *mortal.*

Rule.

The rule of method in verifying a reasoning in which conversion occurs, that is wherever the terms are transferred, accordingly is :—

Recognize the quality of the copula and the quantity of the terms as unchanged; or if changed, as legitimately changed by some other valid movement of thought, as Restriction, Transference, or the like.

Restriction.

§ 122. In logical Restriction, the law of method is, if it be modal, that is, if it be in the copula, that the derivation ever be in the order of the necessary, the assertory, and the problematical, never the reverse; and if it be Quantitative, that is, if it be in the terms, that the derivation be always from the greater quantity to the less.

Disjunction.

§ 123. In logical Disjunction, the law of method requires that the members be recognized as truly disjunct, § 23. Thus the reasoning, *angles are right or spherical; therefore no right angle is spherical*, is unsound because *right* and *spherical* are not logically disjunct or opposite, but congruent, for they may both be predicated of the same subject—of the same angle. In like manner, the reasoning, *angles are right or acute; the angle B is not right; therefore it is acute*, is fallacious, for *right* and *acute* are not complementary.

If there be more than two disjunct members, they are to be reduced to a true dichotomy. § 98.

Transference.

§ 124. In logical Transference of quality from the copula to the terms as in the formula *A is not B; therefore A is non-B*, the subjective law of method requires that the subject be recognized as belonging to the same class as the attribute to which the quality is transferred. Thus the reasoning, *A stone is not vertebrate; therefore it is invertebrate*, is invalid, for a *stone* does not belong to the class made of vertebrates and invertebrates. In the same way, the proposition, *the flying saurian is not struthious, therefore it is carinate*, is valid when it is recognized that flying saurians, being birds, must be of one of the two classes, struthious and carinate, into which all birds are divided.

Composition.

§ 125. In logical Composition, the law of method is the same as that of the concept. §§ 105–108.

Mediate Reasonings.

§ 126. In all mediate reasoning the first step in verifying is to determine whether the derivation is deductive or inductive; that is, whether it is from a whole to a part, or from a part to its complementary part.

Thus in the reasoning: *Virtue is voluntary because it is free, therefore vice is voluntary*, the verification cannot proceed except as it recognizes the movement of thought as inductive—only as *vice* is recognized as complementary of *virtue.*

Deductive Reasoning.

§ 127. The law of method in verifying a Deductive reasoning directs:—

1. Conclusion.

First, that the conclusion be recognized in regard both to its quality and modality, and also to its terms, the subject being the minor term and the predicate the major term of every valid reasoning.

2. Middle term. Secondly, that the other or middle term be recognized to be the subject of the sumption, and also to contain the minor and be contained in the major term, and to be the predicate of the subsumption.

3. Subsumption. Thirdly, that the subsumption be recognized to be affirmative in quality.

4. Quality. Fourthly, that the quality of the conclusion be recognized to be the same as that of the sumption.

5. Modality. Fifthly, that the modality of the conclusion be no higher than that of the subsumption.

The practical difficulty in verifying this derivation of thought arises from some defective or complicated or irregular form of the statement or from the obscure or equivocal use of language. It is frequently defective by the omission of one or the other of the premises, as in the enthymeme; this defect it may be necessary for a clear recognition of the validity of the reasoning to supply. It is often complicated with immediate reasonings and also with other mediate reasonings, as in the epichirema and the sorites; this complication must be resolved and each reasoning verified by itself. It is often irregular in form by the transposition of the subject and predicate for rhetorical or other purposes, and by the change of the formal order of the three judgments in the reasoning. For practical convenience n verifying this movement of thought the following rules may be of service.

§ 128. PRACTICAL RULES FOR VERIFYING A DEDUCTION.—1. Construct a regular syllogism by finding the proper subject of the conclusion which will be the minor term and consequently the subject of the subsumption; then completing the subsumption by ascertaining the proper middle term in one of the premises, making it affirmative; lastly, forming the sumption with this middle term as its subject and the predicate of the conclusion as its predicate.

2. Verify the *datum* both in the sumption and the subsumption.

3. See that the middle term is a true middle, in whatever form of language expressed, being a logical part of the major and a whole of the minor term.

4. See that the quality of the conclusion is the same as that of the sumption and its modality of no higher degree than that of either of the premises.

The application of the law may be exemplified in the following reasonings:—1. *His imbecility of character might have been inferred from his proneness to favorites; for all weak princes have this failing.* The conclusion in this reasoning being *This prince was weak*, its subject *this prince* is the minor term and its predicate *weak* is the major term. The sumption then must be *Princes who are prone to favoritism are weak;* the subsumption, *This prince was prone to favoritism.* The subjective law of the reasoning is thus proved to be observed and the *datum* being assumed to be true, the conclusion is valid.

2. *King Louis XIV. ought to be held in honor, for the Divine law commands us to honor kings.* The

subject of the conclusion here is *Louis* XIV., and is the minor term of the reasoning; the predicate, *deserves honor*, is the major term; consequently the sumption must be *Kings deserve honor;* the subsumption, *Louis XIV. was a king.* But we observe that the word *king*, here representing the middle term, is used in different senses in the two premises; it means in the sumption *Kings as kings*, kings *in their official character;* in the subsumption it means *kings as individuals and in their personal character.* There is therefore properly no middle term and consequently no valid reasoning. This is an example of the fallacy called *ambiguous middle;* or as there are really four terms, of the fallacy called the *Logical Quadruped—Quaternio terminorum*, and of the species called *a secundum quid ad dictum simpliciter*, or a reasoning from an accidental attribute or relation to an essential attribute or property.

3. *The Cretans were liars; therefore Epimenides, himself a Cretan, who gave this testimony, was a liar.* The conclusion gives as the minor term, *Epimenides*, and the major term, *liar;* the middle term with which these are respectively compared is *Cretan;* hence the sumption is *The Cretans were liars;* but the meaning is not that *all Cretans were liars;* consequently *Cretans* is not a proper middle term. This species of fallacy is technically called the fallacy of *unreal universality.*

4. *Mathematical studies improve the reasoning powers; but as logic is not a mathematical study, it may be inferred that it does not improve the reasoning*

powers. The subject of the conclusion, *logic*, being the minor term, and the term with which it is compared, *mathematical study*, being the middle term, the subsumption is negative—*logic is not a mathematical study;* hence, according to the rule, there is no valid conclusion. § 63.

Inductive Reasoning. § 129. The law of method in verifying the Inductive syllogism directs:—

First, that the conclusion be recognized in regard both to its quality and modality, and also to its terms, the subject being always the minor term and the predicate the major term in every valid reasoning.

Secondly, that the other or middle term be recognized as the subject of the sumption and the predicate of the subsumption, and also as complementary of the minor term.

Thirdly, that the subsumption be recognized as affirmative in quality.

Fourthly, that the quality of the conclusion be recognized as the same as that of the sumption.

Fifthly, that the modality of the conclusion be no higher than that of the subsumption.

The practical rules for verifying an Induction are the same as in a Deduction, § 128, except that in the third rule the middle term should be recognized as a true logical complementary of the minor term constituting the same class.

Thus in the reasoning—an enthymeme—*Vice is voluntary for virtue is voluntary*, we begin with the conclusion *vice is voluntary*, and recognizing *vice* as the minor term and *voluntary* as the major term, we construct the syllogism: sumption, *virtue is voluntary;* and observing that the middle *virtue* is complementary of the minor *vice*, and therefore recognizing the reasoning as inductive, we have the subsumption, *vice is complementary of virtue;* and conclusion, *therefore vice is voluntary.*

Again, in the induction *the bat is a mammal, for it is a complementary of the monkey and the mole, etc., in being viviparous.* In this enthymeme the sumption obviously is omitted. We construct the regular syllogism thus: *The monkey, the mole, etc., are mammals; the bat is complementary of monkey, etc.; therefore the bat is a mammal.*

Further in the reasoning, *the bat is oviparous; for it is complementary of bird, in being winged;* the regular syllogistic form would be: *The bird is oviparous; the bat is complementary of bird; therefore the bat is oviparous.* The fallacy lies in recognizing the concept *winged* as part of the concept *oviparous*, whereas this attribute belongs not to the class *oviparous* but only to a part of it. In other words the subsumption is false in affirming that *bat*, simply because it happens to be *winged*, is complementary of *bird* in forming the class *oviparous*.

Hypothetical Reasoning.

§ 130. The law of method in verifying a Hypothetical Reasoning directs:—

1. That the judgments which form the terms of the sumption be severally verified and that the antecedent member of the hypothetical premise be recognized as involving the consequent;

2. That the subsumption either affirm the antecedent—the Ponent form—or deny the consequent—the Tollent form; and

3. That the conclusion affirm the consequent in the Ponent form and deny the antecedent in the Tollent form.

It will be observed that a Hypothetical reasoning can always be reduced either to a Deductive or an Inductive reasoning; and in verifying, it will generally be found most convenient to make this reduction.

§ 131. PRACTICAL RULES FOR VERIFYING A HYPOTHETICAL REASONING.

1. Put the reasoning into the complete, regular, syllogistic form; the hypothetical proposition always being the sumption; the affirmation of its antecedent member or the denial of its consequent member always being the subsumption;

2. Verify the sumption by recognizing the consequent member as involved in the antecedent either by some immediate reasoning or by legitimate deduction or induction;

3. Verify the subsumption; and

4. Recognize the conclusion as affirming the consequent member of the sumption in the Ponent form or denying the antecedent member in the Tollent form.

EXAMPLES. 1. *Vice must be voluntary if virtue is; and undeniably virtue is voluntary.* The sumption is: *If virtue is voluntary, vice must be;* the subsumption, *But virtue is voluntary;* the conclusion, *Therefore vice is voluntary.* The sumption is verified by recognizing the consequent *vice must be voluntary* as the inductive inference from the antecedent, being its complementary in the class *moral actions;* the subsumption is recognized as true and as affirming the antecedent. The conclusion, being recognized as affirming the consequent, is seen to be true.

2. *If Logic presents a multitude of facts useful to be known, it deserves to be cultivated; but it does not; therefore it ought not to be cultivated.* The reasoning being in full and regular form, we proceed to verify the sumption which we find to be true. The subsumption, however, we find denies the antecedent. There can therefore be no legitimate conclusion from this reasoning, § 72. The conclusion may be true or may be false; this hypothetical reasoning proves neither—proves nothing.

Dilemma.

§ 132. The Dilemma is a Hypothetical reasoning in which the sumption rests upon a disjunction, which is established or removed in the subsumption. The reasoning is properly hypothetical; that is, the derivation of the conclusion characteristically turns upon the relation between the hypothetical or antecedent member, not on the disjunction. It is to be verified in the same way as the simple hypothetical; but more care is necessary in verifying the disjunction.

EXAMPLE. *If this man were wise he would not speak irreverently of Scripture in jest; and if he were good he would not do this in earnest; but he* *does it either in jest or in earnest; therefore he is either not wise or not good.* The reasoning is in regular form; the subsumption affirms the antecedent in both its disjunct parts. The conclusion therefore affirms the consequent alternatively in its disjunct parts.

Disjunctive Reasoning.

§ 133. In the Disjunctive Reasoning, the law of method requires:—

1. That the disjunction in the sumption be verified, reducing contrary opposition to pure contradictory when necessary;

2. That the subsumption remove the disjunction by positing or by sublating one of the disjunct members of the sumption; and

3. That the conclusion be of opposite quality to that of the subsumption and have for its predicate the disjunct member not posited or sublated in the subsumption.

§ 134. Practical Rules for Verifying a Disjunctive Reasoning.

1. Put the reasoning into the full regular form of a disjunctive syllogism, taking for the sumption the disjunctive proposition, and for the subsumption the proposition which posits or sublates one of the disjunct members;

2. Verify the sumption as a true disjunction, reducing, if necessary, contrary to pure contradictory opposition;

3. Verify the subsumption as a true positing or sublating; and

4. Recognize the conclusion as a positing of that

disjunct member of the sumption which is not sublated in the subsumption or a sublating of that member which is not posited in the subsumption.

EXAMPLE. *A fungus is a plant, for it is either a plant or an animal, and it is not an animal.* The sumption here is: *A fungus is either a plant or an animal;* the subsumption, *but it is not an animal;* the conclusion, *therefore it is a plant.* The sumption is verified by recognizing *plant or animal* as the only kinds of substances to which a fungus can belong—*inorganic being* being excluded if necessary by recourse to the regular dichotomous process. The subsumption being recognized as true, inasmuch as it sublates the disjunct member, *animal*, the conclusion correctly posits the other disjunct member, *plant.*

Polysyllogism. § 135. The law of method requires that the compound reasoning, the polysyllogism, whether the *sorites* or the *epichirema*, be verified by reduction to its parts and successive verification of each.

It also requires that the defective reasoning be filled out to its complete syllogistic form.

It further requires that the irregular form, whether the irregularity lie in the changed position of the terms or the changed order of the constituent judgments, be changed for verification, if necessary, to the proper regular form belonging to each variety of reasoning.

Fallacies. § 136. An unsound form of thought of whatever kind is termed a Fallacy. Thus there are *fallacious judgments,* *fallacious concepts*, and *fallacious reasonings.* But inasmuch as the Aristotelian logic confined itself to the reasoning, the term *fallacy* has more commonly been applied to an unsound syllogism.

Fallacies have been distributed into two classes of 1. Intentional, called *Sophisms;* and 2. Unintentional, called *Paralogisms.*

They have also been distributed into two classes, in respect to their seat or source, of 1. *Material Fallacies,* in which the unsoundness is in the *datum;* and 2. *Logical Fallacies,* in which the unsoundness is in the movement of the thought.

Logical Fallacies are further conveniently subdivided into 1. Those which violate the Objective Law, sometimes called *Material;* 2. Those which violate the Subjective Law, called *Formal;* and 3. Those which violate the Verbal Law, called *Verbal.*

Objective Fallacies.

§ 137. Of Objective Fallacies, called also Material in the narrower sense, the varieties that have been more common and hence more prominently recognized in logic are:—

1. *Those of an unreal universality;* as in the sophism: *The Cretans are liars; Epimenides was a Cretan; therefore Epimenides was a liar.* The term *Cretans* in the sumption, if taken universally, is unreal. The proposition is true only as meaning that Cretans are characterized for untruthfulness.— that Cretans generally are untruthful.

2. *Those of an unreal middle;* as *That which moves another body is animated; the magnet moves*

another body; therefore the magnet is animated. The middle term *that which moves another body* is unreal in the sense involved in the reasoning, as moving from its own determination.

Under this general class of Objective Fallacies a number of varieties have been recognized. One is the fallacy *post hoc, ergo propter hoc*, as in the enthymeme: *There will be some great calamity, for a comet has appeared.* The full syllogism would be: The appearance of comets is followed by calamity; there is now a comet; therefore there will be calamity. The sumption is not true in the sense of the reasoning, for it implies the connection of cause and effect between comets and calamities, and hence a universal and necessary connection.

The fallacy of *non causa pro causa* is but another form of the same vicious reasoning. It alleges some other than the real cause of an event; as "Here was preaching against covetousness all the last year, and the next summer followed rebellion; *Ergo*, preaching against covetousness was the cause of the rebellion." Another example is Bishop Latimer's overthrow of this fallacious reasoning: "Before that Tenterton steeple was in building, there was no manner of speaking of any flats or sounds that stopped the haven; and therefore Tenterton-steeple is the cause of the destroying and decay of Sandwich haven. And so," adds the Bishop, "to my purpose, is preaching of God's word the cause of rebellion, as Tenterton-steeple was cause that Sandwich haven was destroyed."

A second is the fallacy of *begging the question,* *Petitio Principii.* Of this species there are divers varieties: 1. the *petitio principii* proper in which a premise is unwarrantably assumed; as the proof that men are bound to obey civil government because of an alleged social compact; 2. the *Hysteron Proteron*, in which the truth of the antecedent is dependent on that of the consequent; and 3. the *Circle*, in which the conclusion is already contained in a disguised form in one of the premises; as *opium will cause sleep for it has a soporific quality.*

A third is the fallacy called *Ignoratio Elenchi*, or *Irrelevant Conclusion;* in which the reasoning is correct, but the legitimate conclusion is different from that which was proposed as the proposition to be proved.

Formal Fallacies.

§ 138. Of the class of Formal Fallacies, several species have been named. One is the fallacy of four terms, called the *Logical Quadruped*, also *Quaternio terminorum.* Its more common form is where the word which should express the middle term is used in two different senses in the different propositions.

A second is that of the *Undistributed Middle*, in which the middle term is not used in its whole extension in at least one of the premises; as *An Athenian is a Grecian; a Spartan is a Grecian; therefore a Spartan is an Athenian.*

A third is the fallacy of *Illicit Process* of the major or minor term, in which the term is used in a wider sense in the conclusion than in the premises.

A fourth is the fallacy of *Negative Premises*, violating the rule that the subsumption must be affirmative.

Verbal Fallacies.

§ 139. Of Verbal Fallacies, or of fallacies *in dictione*, six have been enumerated:—

1. Fallacy of Equivocation, in which the same term is used in different senses;
2. Fallacy of Amphibology, in which a phrase or clause is used in different senses;
3. Fallacy of Composition, in which what is true of individuals is asserted of the whole class, as when we infer that because each person in a nation will die in a century the whole nation will perish in that time.
4. Fallacy of Division, in which what is true of the whole taken as a whole is asserted of each part; as *The properly elected legislators have right to make laws; A. B. is a legally elected legislator; therefore he has right to make laws;*
5. Fallacy of Accent, in which by varying the accent or emphasis a different sense is given to a term;
6. Fallacy of Figure of Speech, in which a figurative expression is construed literally.

EXERCISES IN METHOD OF REASONINGS.

Verify the following reasonings, indicating in such as are unsound the seat of the fallacy.

All just acts are expedient; therefore all expedient acts are just.

All winged animals are not birds; therefore all birds are not winged.

All beings are either resolute or are not resolute; but irrational beings are not resolute; therefore they are irresolute.

A democracy is not subject to violent revolutions, for the great mass of the people have all political power in their own hands.

Every one desires virtue, because every one desires happiness.

The exportation of gold is to be deprecated, for it is the abstraction of so much wealth.

All ruminants of the present age have cloven feet and are horned; therefore this cloven-footed fossil must have belonged to a horned ruminant.

The barometer has fallen; therefore there will be rain.

There will be a change in the weather; for the moon quarters to-day.

The blood is propelled by capillary attraction; for fluids in capillary tubes are raised about the sides of the tubes.

Potassium is easily fusible and volatile at a high temperature; rubidium and lithium must be so likewise since they are also alkaline metals.

No carnivorous animals have four stomachs; all ruminants have four stomachs; therefore, no ruminants are carnivorous.

All plants contain cellular tissue; no animals are plants; therefore, no animals contain cellular tissue.

A man that hath no virtue in himself ever envieth virtue in others; for men's minds will either feed upon their own good or upon others' evil.

Humanity is a moral virtue; the study of polite letters is humanity; therefore the study of polite letters is a moral virtue.

Of two evils the less is to be preferred; occasional turbulence, therefore, being a less evil than rigid despotism, is to be preferred to it.

Truth is not duty; a revelation of duty should not therefore be expected to be true.

Miracles were never performed for the simple reason that they are impossibilities.

Have you left off beating your father? No. Then you are an execrable wretch.

Have you left off slandering your mother? Yes. Then what an execrable wretch you were.

Animal food may be dispensed with, for the Brahmins live without it; and vegetable food may be dispensed with, for the Esquimaux live without it; therefore all food may be dispensed with.

If we never find skins except as the teguments of animals, we may safely conclude that animals cannot exist without skins.

If color cannot exist by itself, it follows that neither can anything that is colored exist without color.

If language without thought is unreal, thought without language must also be so.

Electricity is not the real agent by which the nerves act upon the muscles; for electricity is transmissible along a compressed nervous trunk which has lost from the compression all its power to move a muscle.

Gambling is a violation of the tenth commandment, for it involves a desire to gain by another's loss.

Government is a trust, for it is not a property.

Death must be agreeable, for it is a change, and all change is agreeable.

The ancient Greeks produced the greatest master-pieces of eloquence and philosophy; the Lacedemonians were ancient Greeks; therefore they produced the greatest master-pieces of eloquence and philosophy.

He who calls you a man speaks truly; he who calls you a fool calls you a man; therefore he who calls you a fool speaks truly.

Who is most hungry eats most; who eats least is most hungry; therefore who eats least eats most.

He who necessarily goes or stays is not a free agent; you must necessarily go or stay; therefore you are not a free agent.

Substances are either solid, liquid, or gaseous; the mind is a substance; it is therefore a solid, a liquid, or a gas.

If the fourth commandment is obligatory we are bound to set apart one day in seven for religious purposes; but we are bound to set apart one day in seven for such purposes; therefore the fourth commandment is obligatory.

"A concrete is the name of a thing;" "adjectives are concrete, not abstract;" therefore adjectives are names of things

There must be a Divine Providence, for if there were not, no human governments could long subsist, and history teaches us that various human governments have subsisted long.

If I denied the being of God, I should be impious; I do not deny the being of God; therefore I am not impious.

He is brave who conquers his passions; he who resists temptation conquers his passions; so that he who resists temptation is brave.

Intelligent beings are not fit subjects for experimental inquiry; for where there is intelligence, there is sensibility to pain, and we are not at liberty to inflict pain.

A true philosopher is independent of the caprices of fortune, for he places his chief happiness in moral and intellectual excellence.

It was to be expected that geology would be at first denied as hostile to religion, for astronomy was so denied at its first beginning.

If sharpers are present we ought not to gamble; but there are no sharpers present, therefore we ought to gamble.

Confidence in promises is essential to the intercourse of human life; for without it the greatest part of our conduct would proceed upon chance. But there could be no confidence in promises, if men were not obliged to perform them; the obligation, therefore, to perform promises is essential to the same ends and in the same degree.

Horse is a concrete; and a concrete is a physically existing thing; therefore *horse* is a physically existing thing. But *horse* is a general term, for it includes many individuals; therefore one general term at least is a physically existing thing, and the realists were consequently right in maintaining that our general conceptions are entities.

True virtue is disinterested; but motives ever appeal to our interest or to what concerns us; therefore to be influenced by motives is incompatible with true virtue.

A species is a class of organic beings having a common parentage; evolutionism supposes beings originating without parentage; it therefore rejects the existence of any proper species.

If deference to authority be the source of the principle of duty in the hearts of men, it would be either because such deference is found to be useful or because it is felt it should be deferred to; but the first alternative is rejected by the author of the theory, and the second makes the sense of duty its own source; therefore deference to authority is not the source of the principle of duty.

That which is utterly inconceivable or unthinkable can receive no attribution, for to attribute is to conceive or think. The infinite Being is therefore not inconceivable, for to affirm this is to ascribe to Him this attribute.

Pangenesis maintains that all propagation is by gemmules which pervade every living organism, and are derived from every part of each similar organism in each less remote ancestor. In some families for generations the beard has been shaven; and hence no gemmules could have come from the beard to their offspring; therefore such families must become beardless.

In comparison the two objects compared must both be in the consciousness at the same time or the one present and the other not; but it is impossible that there be two objects at the same time in the consciousness, and equally impossible to think of an object not in the consciousness; on either alternative comparison is impossible.

"Either the *ego* which is supposed to determine or will the action is some state of conciousness, simple or composite, or it is not. If it is not some state of consciousness, it is something of which we are unconscious; something therefore that is unknown to us; something, therefore, of whose existence we neither have nor can have any evidence; something therefore which it is absurd to suppose existing."

Either the sky is some state of consciousness, or it is not. If it is not some state of consciousness, it is something which it is absurd to suppose existing.

"If every instinctive action is an adjustment of inner relations to outer relations, which it is impossible to deny; if every rational action is also an adjustment of inner relations to outer relations, which it is equally impossible to deny;" then "the common notion that there is a line of demarcation between reason and instinct has no foundation whatever in fact."

INDEX.

PAGE
Accuracy, in a judgment, 91
Adequateness, in a judgment, 90
Affirmative judgment, defined, 16
Amplification, defined, 31
Analysis, defined, 111; its two processes, division and partition, 111
Antecedent, what, 37
Apprehension, what. 5
Assertory judgment, defined, 21
Attributes, of four classes, 81
Begging the Question, fallacy of, 136
Categorical judgment, defined, 23
  reasoning, exercises in, 47, 48; two classes, deductive and inductive, 48
Chain of reasoning, what, 73
Circle, fallacy of, 137
Clearness in a concept, how attained, 108
Class names, 85
Classes, gradations of, 105, 106
Cognition, defined, 4
Collective names, 85
Complex reasoning, what, 72
Composite concept, defined, 30
Composition, a kind of reasoning, 41; law of method in, 125
Comprehension, what, 30
Comprehensive quantity, what, 30
Concept, 26–36; defined, 26; two kinds, single and simple, 26; generic and composite, 28, 29; method of, 100–119; framed for occasions of use, 102; objective law, 103; subjective law, 104–108
Conclusion, defined, 50

PAGE
Conditional reasonings, defined, 62; two modes and two kinds, 63
Congruence, defined, 19, 80; in a judgment, 89
Connotatives, of four classes, 87
Consequent, what, 37
Contingent judgment, defined, 21; truth, what, 85
Contradiction, law of, 8, 9
Contradictory opposition, defined, 18
Contrary opposition, defined, 18
Conversion, defined, 37; law of method in, 123
Copula, defined, 13; modality of, 20
Datum in thought, 11; its two parts, object and attribute, 12; verification of, in a judgment, 88; in a concept, 100
Deduction, what, 43; its law, 43
Deductive reasoning, defined, 48; its terms, major, middle, and minor, 49; its propositions, sumption, subsumption, and conclusion, 50; exercises in, 55, 56; law of method in, 125; practical rules for verifying, 127
Definition defined, 109; rules of, 111
Determination, defined, 31; how effected, 107
Dilemma, defined, 24; dilemmatic syllogism defined, 65; its four forms, 66; law of method in, 132
Dichotomy, what, 112
Discursive knowledge, 4

PAGE

Disjunct members, what, 16
Disjunction, Law of, 8, 9; a form of reasoning, 39; law of method in, 124; practical rules for verifying, 133
Disjunctive judgment, defined, 16; its two forms, 17; how verified, 92, 93
Disjunctive particles, 94
Disjunctive Quality, defined, 16
Division, defined, 32, 111; how effected, 111; principle of, 114; rules of, 114
Elements of thought include laws and forms, 5
Enthymeme, defined, 51
Epichirema, defined, 74
Exact Science, defined, 2
Excluded Middle, 9
Exclusion, Law of, 9, 10
Exercises in the parts of a judgment, 14; in the kinds of judgment, 24; in concepts, 36; in categorical reasonings, 47, 48; in deductive reasonings, 55, 56; in hypothetical reasonings, 67; in irregular reasonings, 75, 76; in the method of judgments, 96; in the method of concepts, 118, 119; in the method of reasonings, 138–144
Extension, what, 30
Extensive quantity, what, 30
Fallacy, defined, 134; classes, 135
Figure, defined, 54; four in number, 54
Formal conditions of thought, 77
Forms of thought, 10–76
Generalization, defined, 31; how effected, 104
Generic concept, defined, 30
Hypothetical judgment, defined, 23; law of method in, 95
Hypothetical syllogism, defined, 62; its three propositions, 64; ponent and tollent modes, 64; exercises in, 70, 71; law of method in, 130; practical rules for verifying, 131

PAGE

Hysteron proteron, fallacy of, 137
Identical judgment, defined, 22
Identity, Law of, 7, 9
Ignoratio elenchi, fallacy of, 137
Illicit process, fallacy of, 137
Immediate reasoning, defined, 37; kinds, 37–43; exercises in, 41–43
Induction, what, 44; its law, 46
Inductive syllogism, defined, its three terms, 59; its three propositions, 60; exercises in, 60–62; law of method in, 129
Intensive quantity, what, 30
Irregular syllogisms, what, 71; three kinds, 72; exercises in, 75, 76
Irrelevant conclusion, fallacy of, 137
Judgment, the primitive form of all thought, 10; defined, 10; composed of three elements, 13; exercises in parts of, 15; division of, 15; Affirmative, negative, disjunctive, 16; assertory, necessary, contingent, 21; identical, partial, 22; categorical, hypothetical, 23; dilemmatic, 24; exercises in kinds of, 24; law of method in, 88–99; how verified, 96; exercises in method of, 96–99
Knowledge, presentative or discursive, 4
Laws of thought, their source, 6; the general law of all thought, identity, 7, 9; of the same and the different, 8; of contradiction, 8, 9; of disjunction, 8, 9; of exclusion, 9, 10
Logic, defined, 1; an exact science, 2; more fully defined, 5
Logical Quadruped, fallacy of, 137
Logical science, divided, 5
Major premise, what, 50
Major term, what, 49
Mass names, 85
Material conditions of thought, 77, 85; in a judgment, 89
Matter of thought, its reality, 78

PAGE
Mediate reasoning, defined, 43; kinds, 44
Method of thought, 77-144; its province, 77
Middle term, what, 49
Minor premise, what, 50
Minor term, what, 49
Modal judgment, defined, 21; law of method in, 94
Modal restriction, what, 38
Modality explained, 20; assertory, necessary, and contingent, 21
Mood defined, 53; number, 53
Necessary judgment, defined, 21; truth, what, 83
Negative judgment, defined, 16
Nomenclature of concepts, 33
Non causa pro causa, fallacy of, 136
Non-contradiction, law of, 8
Objective law of thought, 77; of a judgment, 91; of a concept, 103; of a reasoning, 121
Opposition defined, 17; its three kinds, 17; pure contradictory, contradictory, and contrary, 17
Partial judgment, defined, 22
Partition, defined, 32, 111; how effected, 117; principle of, 118; rules of, 118
Perception, defined, 4
Petitio principii, fallacy of, 137
Polysyllogism, what, 73; law of method in, 134
Polytomy, what, 113
Ponent mode of syllogism, what, 62; of hypothetical syllogism, 64
Post hoc, ergo propter hoc, fallacy of, 136
Predicate, defined, 12
Presentative knowledge includes perceptions and intuitions, 4
Progressive reasoning, defined, 75
Proper names, 85
Proposition, defined, 11
Pure opposition, defined, 17
Quality, defined, 15; simple and disjunctive, 15

PAGE
Quantitative restriction, what, 39
Quantity, extensive and comprehensive, 30; law of, 32
Quaternio terminorum, fallacy of, 137
Reasoning, 37-76; defined, 37; its two parts, antecedent and consequent, 37; kinds, immediate and mediate, 37; method of, 120-144; verification of, 120; exercises in the method of, 138-144
Regressive reasonings, defined, 75
Restriction, defined, 38; modal and quantitative, 38; law of method in, 124
Science, its different meanings, 1
Simple concept, defined, 29
Single concept, defined, 29
Sorites, defined, 74
Subject, defined, 12
Subjective law of thought, 77; of a judgment, 92; of a concept, 104; of a reasoning, 122
Subsumption, defined, 50
Sumption, defined, 50
Syllogisms, defined, 43; two kinds, categorical and conditional, 43
Symbols of relations of terms in a reasoning by circles, 52
Terms of a judgment, defined, 12; of a syllogism, 49
Thinking distinguished from the matter of thought, 11
Thought, different meanings of the term, 2; distinguished from perception, 3; defined, 4; its essential nature and fundamental law, 7; primitive and derivative, 7; positive and negative, 7
Tollent mode of syllogism, what, 63; of hypothetical syllogism, 64
Transference, a kind of reasoning, 40; of quality and of modality, 40; law of method in, 124

PAGE
Trichotomy, what, 113
Undistributed middle, fallacy of, 137
Unreal middle, fallacy of, 135
Unreal universality, fallacy of, 135
Verbal conditions of thought, 77; correctness and perspicuity, 85
Verbal fallacies, 138
Verbal law of thought, 77
Verification of *datum* in a judgment, 88; in a concept, 100; in a reasoning, 120

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